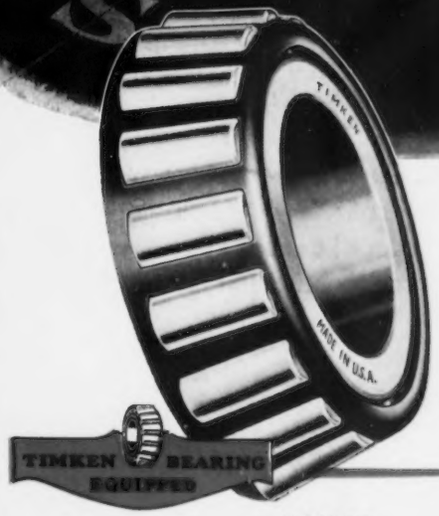
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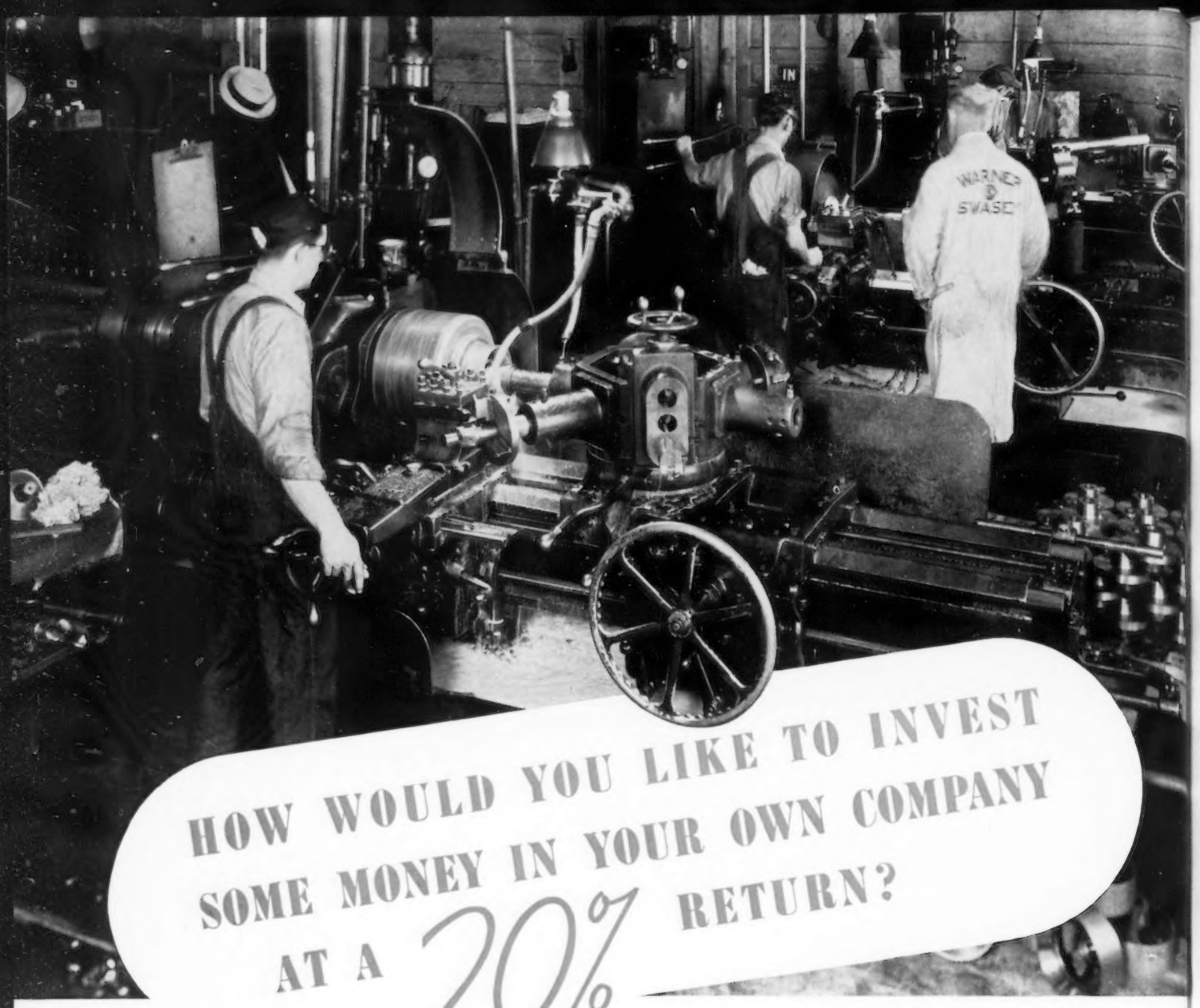
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THE IRON AGE

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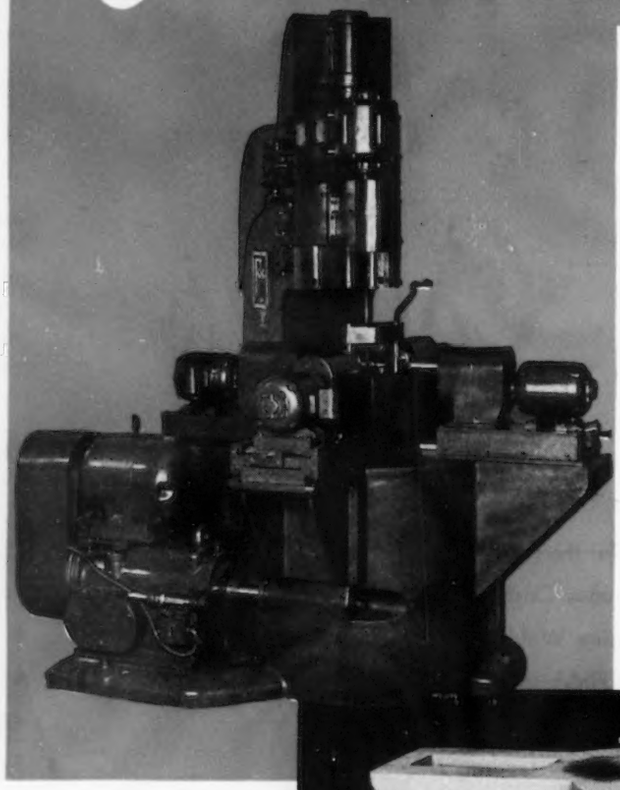
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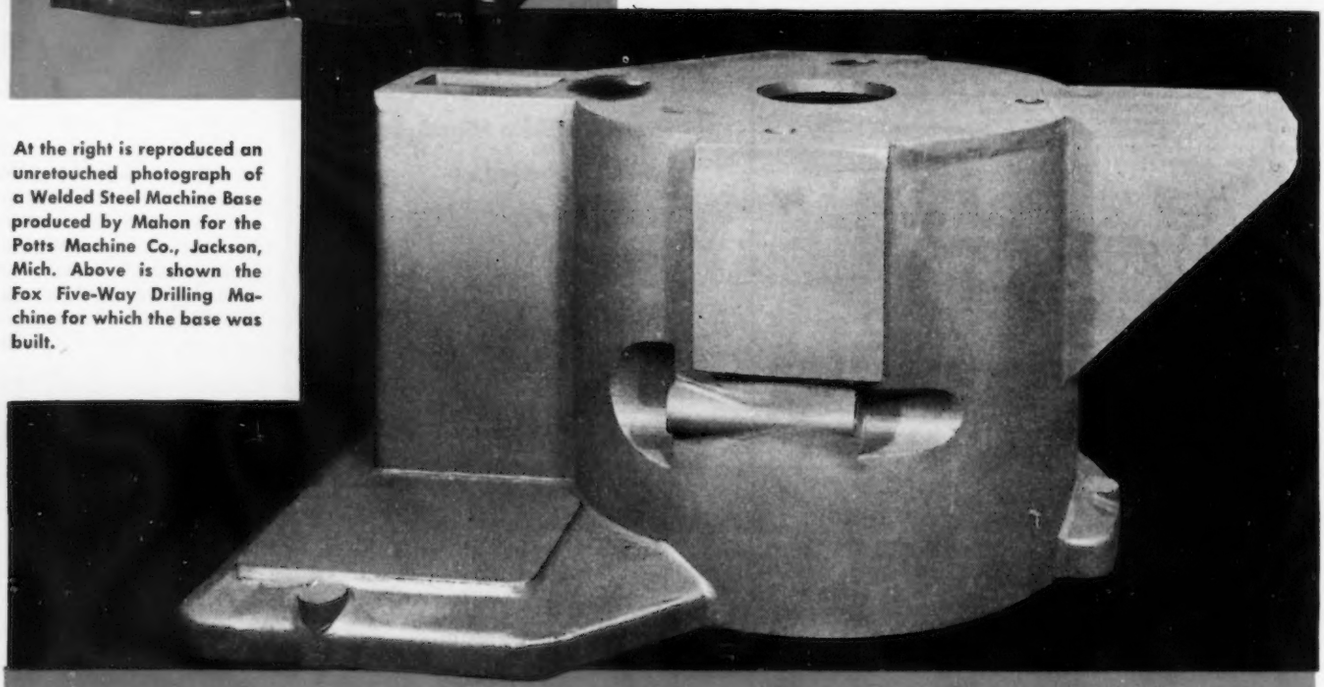
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MAHON

... THE IRON AGE ...

APRIL 4, 1940

ESTABLISHED 1855

Vol. 145, No. 14

Take Out the Pins

SALES resistance is a luxury that most of us can't afford. Like taxes, it is something that we try to reduce to a minimum.

On the basis of this principle, makers of machinery and suppliers of service in our industry try to make it as easy as possible for the customer to put the product into use. Selling, in fact, really begins after the sale is completed.

That, at least, is the theory. Every sales manager in our industry will subscribe to it and tell you that he follows it in practice. But I fear that some of us are deceiving ourselves in this matter.

Last week, for example, I came across a sale that was unsold after it was sold, simply because the concern that made and merchandised the product had unwittingly copied the strategy of the shirt industry.

The shirt industry is one of America's favored industries. Society has ruled that men shall wear shirts. So, at times, we have to buy new ones.

The shirt merchandisers have developed the most ingenious and formidable obstacle to prevent the easy application to use of their product. Men hate to buy new shirts because there are so many pins in them.

If the inventive genius that has been spent by the shirtmakers in devising new ways to conceal pins could be put to constructive and useful purposes, instead of being applied to building sales resistance, America might well be much further along on the path to recovery.

What has all this to do with iron and steel and machinery in the capital goods industry?

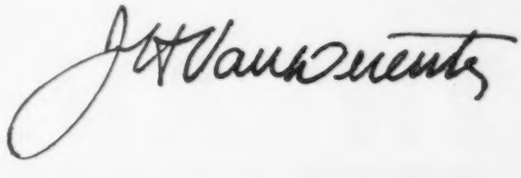
It has a great deal to do with it, as I learned from the case of the machinery maker whose product was unsold after the sale was made.

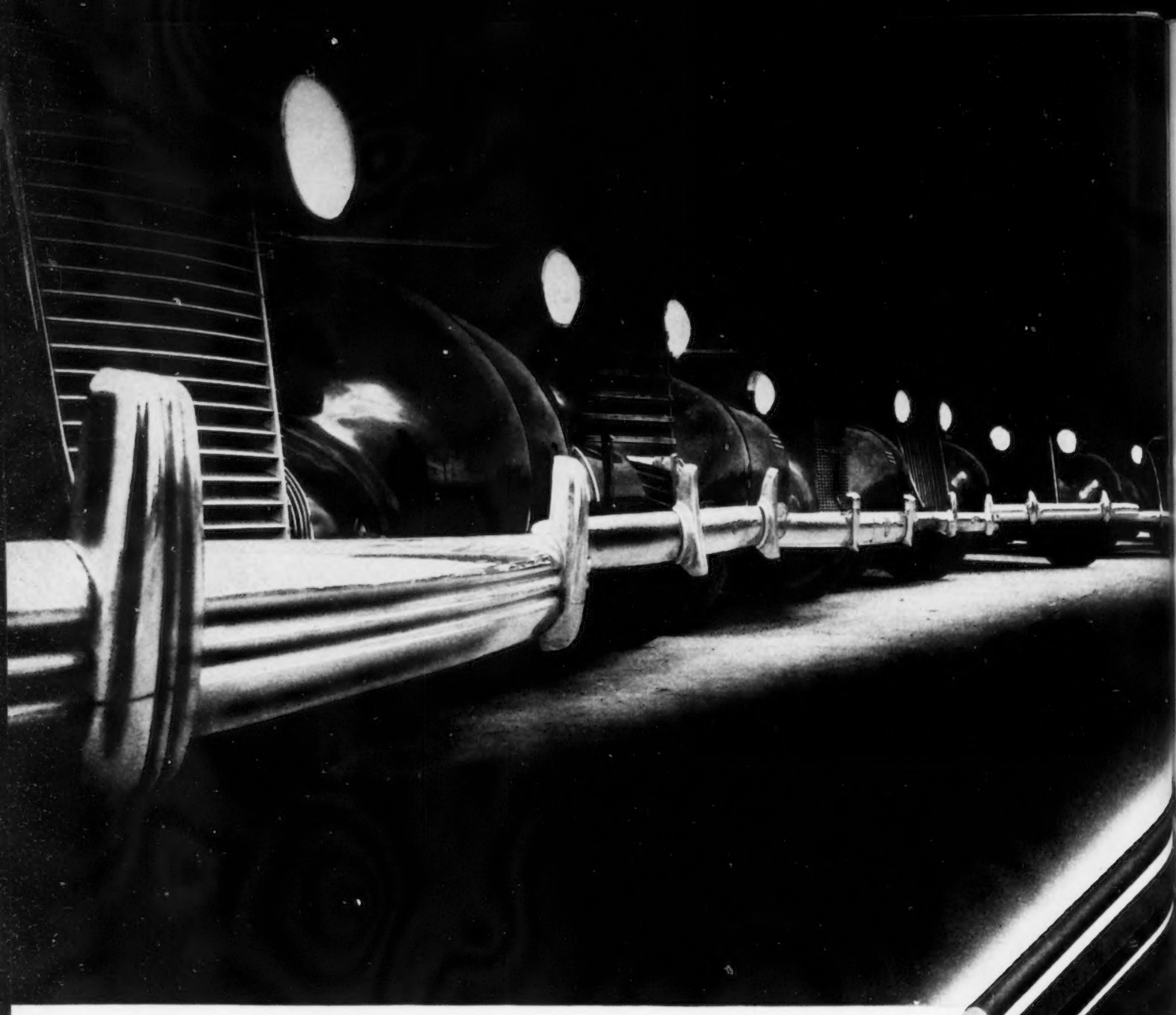
This machine was sold on its merits. It was a good machine that really fitted the customer's requirements as closely as a properly sized shirt would have fitted his anatomy. But the machinery maker put too many pins in the package.

It so happened that this was the first machine of its make to enter this particular plant. The people there were not familiar with it. And in "knocking it down" for shipment, the maker had acted upon the presumption that the purchaser was as familiar with the product as its maker. The instruction sheet was as intelligible as an income tax blank.

By the time that the puzzle was solved and the machine was ready to operate with no parts left over, the plant people were in a frame of mind to condemn anything that came out of it.

Pins in shirts. Are there any in yours?





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CONTINUOUS CASTING



ETCHED cross-section, actual size, of brass billet (62.5 Cu, 2½ Pb, 35 Zn) continuously cast in the Junghans machine.

By

T. W. LIPPERT

Metallurgical Editor, The Iron Age

o o o

ONE single, simple process permitting a direct jump from molten metal to strip, sheet or billet is obviously reasonable. So reasonable, so apparently simple, that the past 100 years have brought forth a flood of schemes, innumerable variations of several basic ideas, most of which were doomed to burial in the patent office, a few of which actually experienced the trial by fire—and for the most part to be found wanting.

Today, quietly and for the most part secretly, there is a resurgence of activity. At Scovill Mfg. Co. a comparatively simple German unit is turning out 1,500,000 lb. of extruding billets each week, week in and week out, without shutdown; Williams, at Latrobe, has an excellently designed mold which shows attractive possibilities with steel; Eldred's unit turns out beautiful metal and is being pointed, in part, toward scrap conversion in small plants; both the Aluminum Co. of America and American Smelting & Refining Co. have commercial outfits in daily operation; a Pittsburgh steel maker recently spent a small fortune on the Merle strip casting process; and Hazelett has devised a new high speed strip casting unit that will hit over 500 ft. per min. with non-ferrous metals and possibly with alloy steel.

Just exactly what are these processes? How do they operate and how do they perform? Is there a general relationship, and if so what?

The whole technique of continuous casting is at the same time complex, confusing and deliberately beclouded. The various processes are, however, for the first time brought into the open on the following pages, and an effort is made to orientate the practice of continuous casting as it is today—to lay down present limits and point toward future possibilities.

RACING across the yard of his St. Pancras factory in England almost 100 years ago, the youthful Henry Bessemer finally got some unfrozen metal to a pair of horizontal rolls. (See sketch and Bessemer's own record, next week.) He not only obtained some ragged strips of iron, but sold himself on the idea that such was the way to produce steel—no ingot mold, no soaking pits, no breakdown or roughing rolls; just one simple inexpensive machine to transform liquid metal to semi-finished strip or sheet.

Norton and Hodgson took Bessemer's idea almost unchanged (see Norton's diary, next week) around the turn of the century—they were equally enthusiastic and equally unsuccessful in establishing commercial operation. A contemporary of Norton and Hodgson, a Swede, in Worcester, Mass., Johan O. E. Trotz, was the first to intelligently swing away from the then established idea of pouring molten metal into a moving mold, i.e., two horizontal rotating rolls, spaced to form a mold chamber, the speed of rotation being the same as the ingot so that there is no relative motion between the two. Trotz kept his mold stationary and moved the metal through it, and his series of patents (648,091; 705,721; 770,130; 894,410) is an easily understood record of how he encountered various difficulties and progressively groped for solutions. (See two sketches on opposite page.)

Within the past decade, and today, Hazelett has injected new life in the Bessemer-Norton-Hodgson idea with his similar casting-rolling mill (see sketch and description next week), but recently has shifted to a variation in the horizontal-roll scheme, a variation which is essentially a casting unit of very high speed. The Trotz idea of pouring molten metal through a stationary mold has splayed into the Williams, the Junghans, the Poland, the Eldred and related processes.

All variations of each of the two basic ideas—moving mold and stationary mold—could be harshly judged as being identical, or the inventors involved just a bunch of Micawbers. In fact, today's machines might be compared with Bessemer's original sketch or Trotz's original sketch, and the conclusion reached that little sensible progress has been made—that today's machines are cursed with the deficiencies of their predecessors, i. e., uncertain operation, low output, sometimes good metal and sometimes very poor metal.

However, progress undeniably has been made. There has accumulated a great fund of knowledge as to how to operate the machines and how to direct and control the thermal exchange between molten metal and mold wall. Williams, for instance, has overcome the general fear (of explosions) of getting molten metal near water, and has devised molds with extremely thin walls and literally scours the heat off the one side with thin films of water at high speed. Junghans moves his mold cyclically and depends on relative inertia of mold and metal to minimize skin fractures in continuously cast billet. Eldred and Poland design their graphite mold and cooling system to secure an unblemished skin and a desirable metal structure. And Hazelett employs a large inexpensive roll shell and a light topping roll to obtain rapid cooling and high speed.

Perhaps all these refinements seem to mean little, but certainly in the end they will determine the broad commercial acceptance of these methods of producing metals. An apparently insignificant detail may well be the crux of the whole problem in any one machine. Certainly, many of the present-day metal production machines are based on just such apparently insignificant details. The continuous mill, for instance, has a slight camber in the rolls, and it is this camber that transforms the series of roll stands from ineffectual masses of metal to the highly efficient sheet rolling unit it is.

Out of all the welter of patents there have been cast up, say, eight or nine distinct processes, these particular ones rating detailed attention by being far advanced experimentally or downright commercial successes. They are:

INGOT OR BILLET UNITS:

(1) Junghans process
(2) Williams process
(3) Eldred process
(4) American Smelting & Refining Co. process. (Poland)
(5) Aluminum Co. of America process. (Eldred-?)
(6) All others, such as Crampton, Goss, etc.

STRIP OR SHEET UNITS:

(1) Hazelett casting-rolling mill
(2) Hazelett strip-casting mill
(3) All others, such as Merle process.

It is the author's intention to describe the strip and sheet casting units in next week's issue. The paragraphs immediately following are concerned with the ingot and billet casting units. With the descriptions at hand, even the casual reader will note that for all of the different procedures there is a definite consanguinity. For the billet and ingot casting units particularly, the same casual reader might be prone to attach too little importance to the nuances in design. But, the ingot casting units certainly have definite variations in performance—in speed, in control, in length of uninterrupted run, in quality of metal and metal surface, etc.

Junghans at Scovill

Of the ingot and billet casting units, the Williams process undoubtedly has the most data at hand for ferrous metals. On the other hand, the Junghans machine is firmly established abroad for a variety of non-ferrous metals and has one particularly successful installation in this country, at the Scovill Mfg. Co., Waterbury, Conn.

There has been no serendipity involved in the development of continuous casting by Siegfried Junghans[1]. Rather, he and a number of assistants have for years patiently and painstakingly exhausted practically every variation in mold and pouring speed, temperature, and cooling technique that came to mind. All these data are meticulously listed in Junghans little black notebooks. Today's various commercial mills are the result of all these efforts, still being subject to refinement and change, of course—change to lift the production speed, to permit continuous production of pierced and/or composite billets, and continuous casting of various ferrous alloys.

There is a Junghans unit working continuously day in and day out at the plant of I. G. Farben Aktiengesellschaft, Bitterfield, Germany, on aluminum alloys. Either round billets (up to 20 in. in diameter) or rectangular ingots are continuously cast. At the plant of Wieland A.G., Ulm, Germany, two units are operating on brass and one unit on aluminum alloys. One of the brass machines turns out 8-in. diameter rounds for extrusion into condenser tubing. The alloy is mostly aluminum-brass, a temperamental analysis which previously had been expensively cast in individual ingots by the French tipping-mold process. The other brass machine casts cartridge alloy in ingot form,

[1] Siegfried Junghans, about 58 years of age, an ultra-suspicious German inventor, is a member of the mechanically gifted Junghans family which built up the great watch and clock industry in the Black Forest. Irving Rossi, 40 Wall Street, New York, owns 50 per cent of the continuous casting process and takes care of licensing throughout the world. Principal U. S. patents are Nos. 2,135,183-4. Siegfried's brother developed a highly successful mechanical anti-aircraft shell fuse for the German army, which recently was purchased by the United States and is now standard for 75 mm. shells.

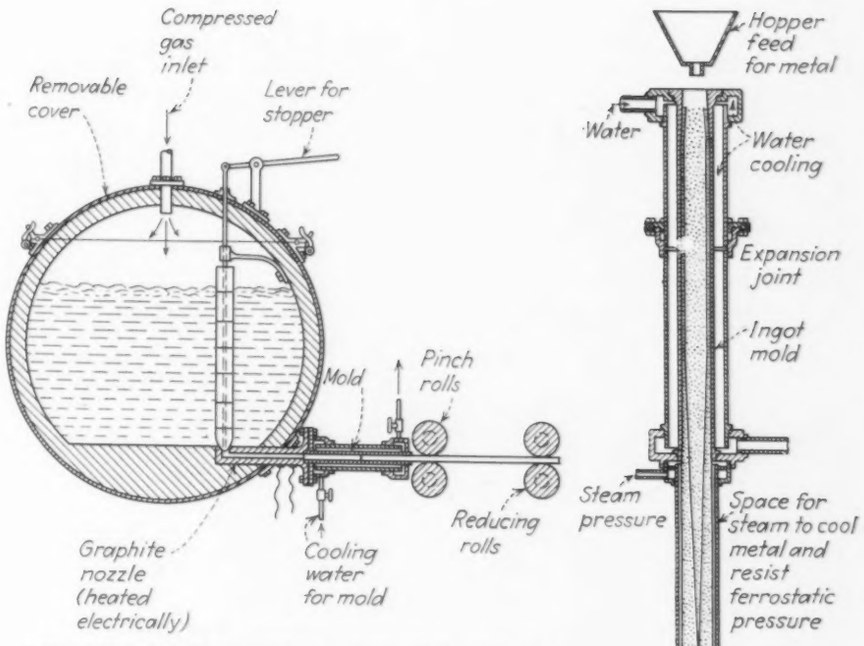
measuring 24x4 in. in cross-section, which is quite a sizable chunk of metal. At the plant of Wintershall A.G., Kassel, Germany, a machine casts magnesium alloys, and Jünghans himself has a unit at Stuttgart, Germany, turning out aluminum-alloy ingots for the German Government. At the same plant, Junghans' newest machine not only continuously casts ingots but replaces the pinch rolls with heavy reducing rolls and *thereby gives the ingot a heavy reduction while it is still hot.* A machine has just been built and soon will be in operation at the plant of James Booth, Ltd., Birmingham, England, for casting aluminum-alloy rounds, 12 to 16 in. in diameter, for subsequent extrusion into tubes.

The only other Junghans unit is that which has operated for over a year at Scovill Mfg. Co. Results to date have been eminently satisfactory —over 60,000,000 lb. of brass has already passed continuously through the mold, mostly as 7⅞-in. rounds for subsequent extrusion, and current schedules call for more than 1,250,000 lb. of metal per week off this one machine. Doubtless output could be stepped-up to far above this level—but facilities are not sufficient to supply molten metal continuously at such a pace; nor are salesmen currently able to dispose of finished rod, wire and tubing at a faster rate.

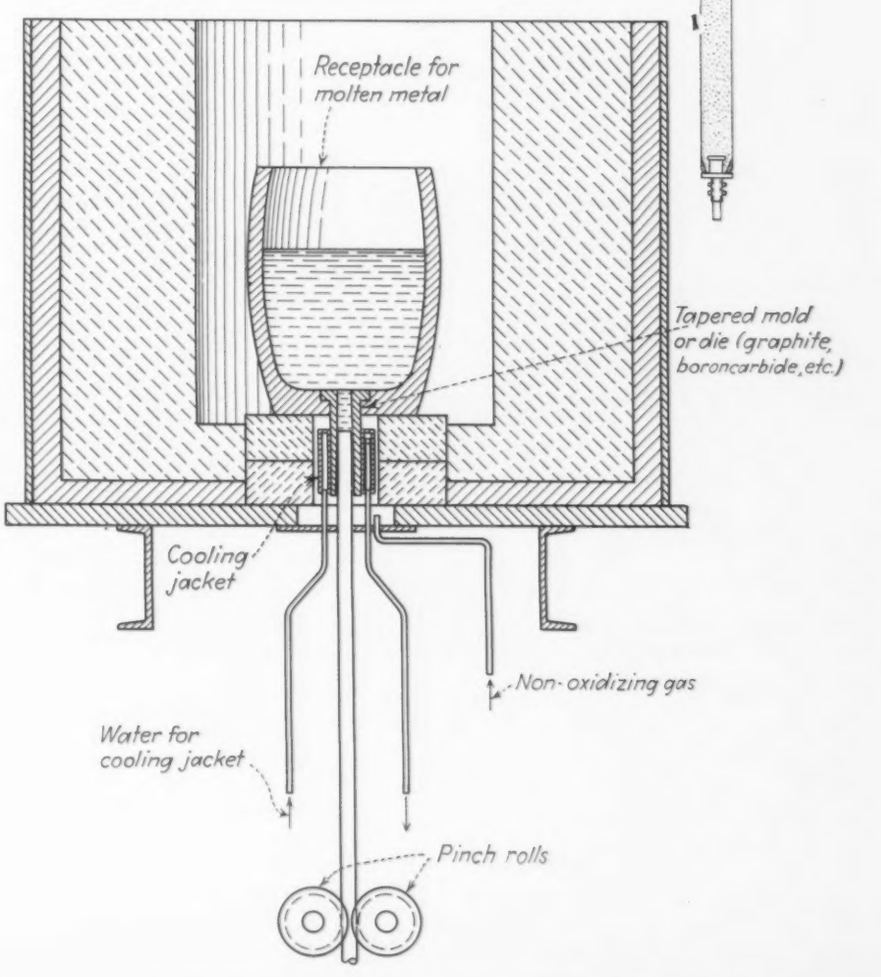
The brass industry is particularly conditioned to be receptive to a radically different method of casting, such as the Junghans machine.

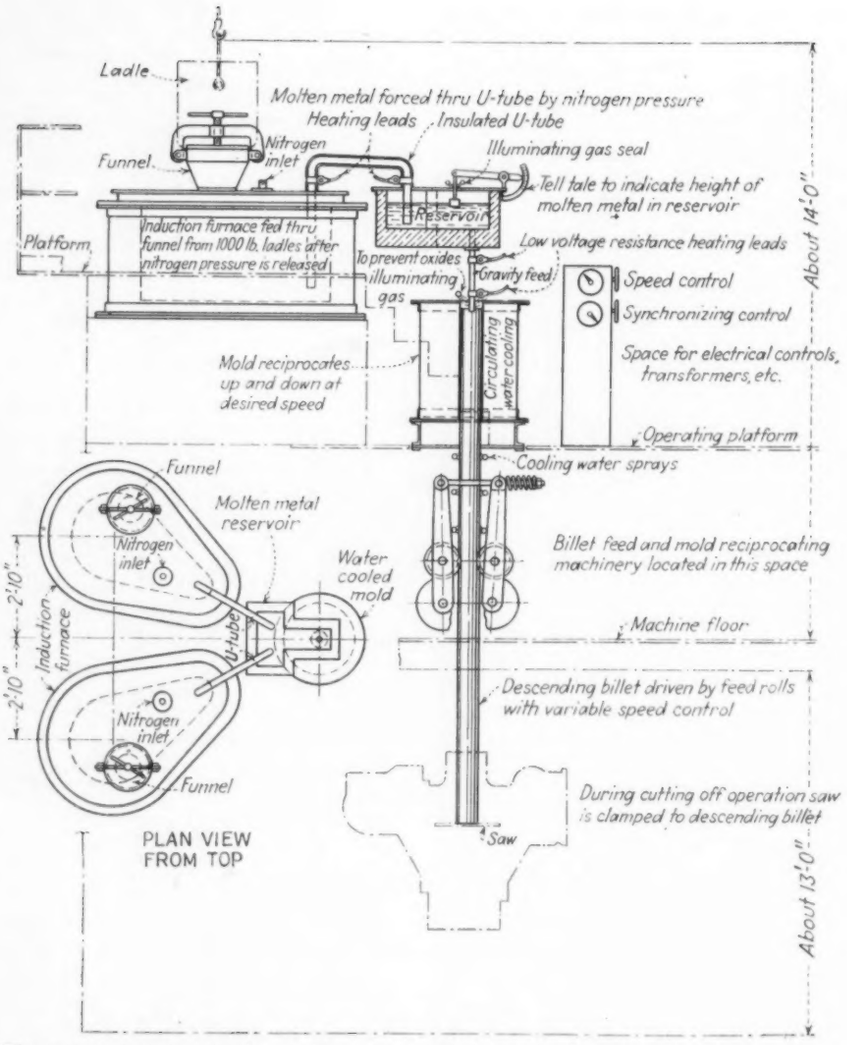
In two decades hand casting, unchanged since antiquity, was discarded, to be followed by a concatenation of dramatic shifts in production technique[2] which has kept the industry's mind open to all new possibilities. In

[2] Connecticut Valley brass companies, family affairs and highly secretive, were up to, say, 1916-18 pretty much at the mercy of even more secretive father-son guilds of brass casters. Head casters were not employees of the brass companies, but rather contracted to supply so many ingots, and were a power unto themselves to hire and fire assistants. A witch concocting a brew had nothing on a brass caster, each of whom specialized in a particular analysis of brass. Multiplied war demands for brass found the companies hamstrung by the tight hierarchy of casters, and there resulted dramatic changes hardly noticed during war-time labor and production hysteria. Metallurgists were hired to investigate brass compositions; pyrometers developed to establish optimum pouring temperatures; operators scrapped conventional small individual molds and substituted multiple "book" molds and basket pouring; small crucible melting units gave way to large oil-fired furnaces, which in turn were scrapped to make way for "revolutionary" Bennett low-voltage (18 v.) "contact resistance" furnaces, these latter being scrapped sometimes on delivery as the Ajax induction furnace rapidly came to the fore as a highly efficient and dependable melting unit.

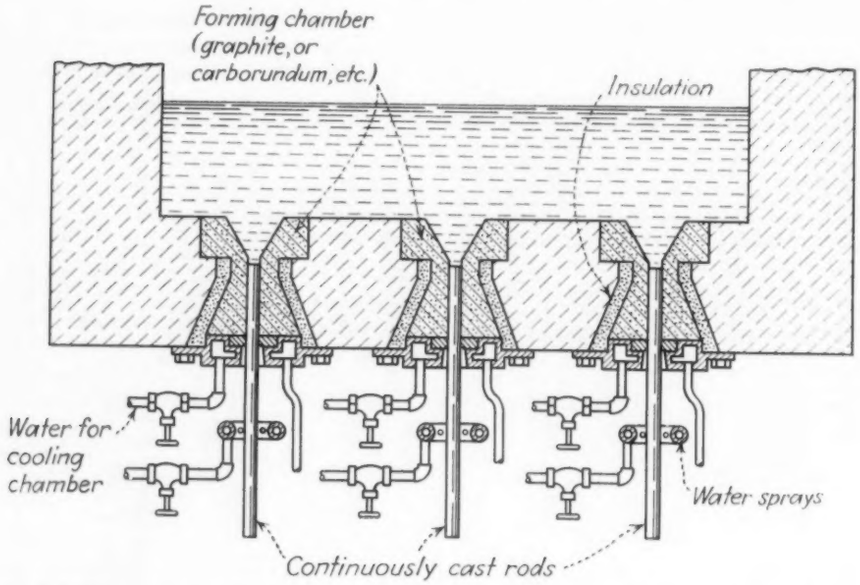


JOHAN TROTZ, around the turn of the century, conceived the continuous casting of ingots as shown at the right, and a few years later proposed the alternate scheme shown above. Many years later Poland and Lindner proposed the arrangement shown below, a modification of which is currently used by A. S. & R.





THE detailed sketch above shows the arrangement of parts and mode of operation of the Junghans machine, a number of which are in operation in Germany and one each in England and the United States.



MANY years ago Eldred conceived the continuous casting of rods as shown above. Later, production units showed some modification, particularly in the location of cooling elements.

particular Scovill's approach to the Junghans machine is interesting enough to warrant a degree of ramification.

About eight years ago Scovill experimented extensively with the Hazelett casting-rolling mill. The brass was cast between two rolls and subject to a certain degree of reduction (See THE IRON AGE, March 21, 1935) and the metal so obtained was frequently metallurgically satisfactory, although some segregation of the low-melting point constituent occurred. Physically the slight segregation was no bar in numerous applications, but the resultant surface discoloration was undesirable in highly polished or plated work. A major disqualification, however, was the slow speed, a speed not being sufficiently promising to warrant displacement of existing ingot casting equipment.

Scovill's next attempt at direct production was the continuous casting of rounds by the Eldred process, from 6 in. down to ⅝ in. in diameter. Metallurgically beautiful metal was turned out, but here again the output was quite small—at best Scovill could get only several hundred pounds of metal per hour.

Shortly thereafter the company heard of a Junghans process. Copies of the patents were secured and studied by Scovill engineers, who came to the conclusion that the drawings were deliberately inaccurate, or if the machine was as shown it would most likely not operate satisfactorily. None the less, Scovill sent two engineers to the Wieland plant a few miles outside of Ulm, Germany. What they found there was a Junghans machine identical with the patent drawings, operating 24 hr. a day, turning out for the most part flat slabs about 20 x 4 in., which were subsequently rolled down for fabrication into shell casings.

An agreement was reached—Siegfried Junghans would build a machine for Scovill, send a crew of men to Waterbury to erect it, acceptance of the machine to be predicated on a continuous seven-day run without shutdown, casting a minimum of 7700 lb. per hr. of 7½ in. diameter billets of high-speed screw machine brass. Scovill engineers expected a few days of experimentation, much to the annoyance of the Germans, who screwed up the last bolt and yelled for metal. From then on there was more trouble assuring a steady supply of metal to the unit than trouble with the unit itself.

The construction of the Junghans machine is both compact and simple,

as shown in the sketch on the opposite page and the photos on page 37. One-half ton ladles of brass are brought from a series of Ajax melting furnaces and bottom poured into the sealed holding furnace shown in the sketch. Oxygen-free gas is kept above the metal in the holding furnace under some pressure. This gas comes from a small gasoline engine which consumes about 6 gal. of gasoline per day. The engine operates a gas compressor which compresses its own exhaust gas, which is then cooled and scrubbed and passes on to holders, from which it is valved to the holding furnace. Occasional adjustment of this valve changes the rate of delivery of the molten metal to the mold.

A U-tube extends below the metal surface in the holding furnace, and carries the metal over into a feeding chamber, whence it passes down into the mold by means of a gravity feed through the bottom. Note that there are three separations of metal from surface dross—first when the metal passes through the bottom of the ladle into the holding furnace, second as the metal passes from holding furnace to the feeding chamber, and third as the metal drops down into the mold. And, of course, if any floating impurities should get through they would float on top of the constant molten pool in the mold and then could be skimmed off. Note also that the several tubes carrying the molten metal—from holding furnace to chamber, and from chamber to mold—are heated electrically by direct resistance, to prevent metal freezing on the inner walls.

The mold itself is ordinary commercial drawn copper tubing, with about ½-in. wall thickness; it can be round up to 18 or 20 in. in diameter, square, or various rectangles. Any of these molds can be placed in the same water jacket, a pack seal being used top and bottom. The cooling arrangement is quite casual—there is no attempt to feed cooling water through under great pressure, nor is the water jacket altered as the mold cross-section changes. The water flow is changed, of course.

The particularly conspicuous characteristic of the Junghans machine is the automatic movement of the entire mold, water jacket and all. By a cam arrangement, the mold moves down at the *same speed as the emerging billet*, through a distance of about 1¾ in., and then snaps back quickly to its original position, the snap-back speed being about three times the speed of the billet. The function of the movement is to present a constant changing section of the mold wall to the molten metal, and also because of relative inertia to minimize skin ruptures in the billet. Junghans has elaborate tables to set the amplitude of the mold cycle and speed of snap-back for different types of metal, cross-section of billet, speed, etc. The operator occasionally sprays the top of the molten metal with oil, which because of the surface miniscus runs to the wall and is in part burnt and part carried down to lubricate the wall surface. Many different types of oil will work satisfactorily. In Germany an oil is used which is synthesized from turnips. It's not very good, but it works.

The billet is red as it comes from the mold, and is cooled by means of water sprays. A 7⅞-in. diameter billet comes out at the rate of 10 in. per min. but much higher speeds are deemed possible, if so desired and if molten metal is available. On a lower platform an operator handles a cut-off saw, which is brought into place and moves down with the billet as it traverses. The severed billet drops off and passes down a chute to be carried to an extrusion press. Occasional chips from the saw go to the laboratory for analysis, and the remainder is collected in another chute and passes back to the melting furnaces. Obviously scrap losses are negligible.

The temperature of the metal (brass) in the mold is about 1750 deg. F., which is about 135 F. deg. lower than the temperature of metal poured into conventional ingot molds. There is no scarring or erosion of the copper mold. In addition to the three separations of metal from the surface dross, the large holding furnace assures mixing, and the analysis of the billets produced is said to be more constant and easily controlled than in conventional practice. Metallurgically, the metal produced is as good and often better than that turned out by conventional ingot pouring. About any distribution of crystal size and direction can be secured by varying the cooling, both in the mold and in the sprays at the exit end of the mold.

It might be pointed out that ingots from the Junghans machine usually have a sizable cross-section, as apposed to generally smaller cross-sections handled by some of the other machines, particularly Eldred's unit. The Jung-

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ALLOY steel billet (4 x 4 in.) emerging from the Williams continuous casting machine at a speed of about 10 ft. per min. The cooled section (center) and the twist in the billet resulted from turning off cooling sprays and stopping the movement in order to take this natural color photograph.

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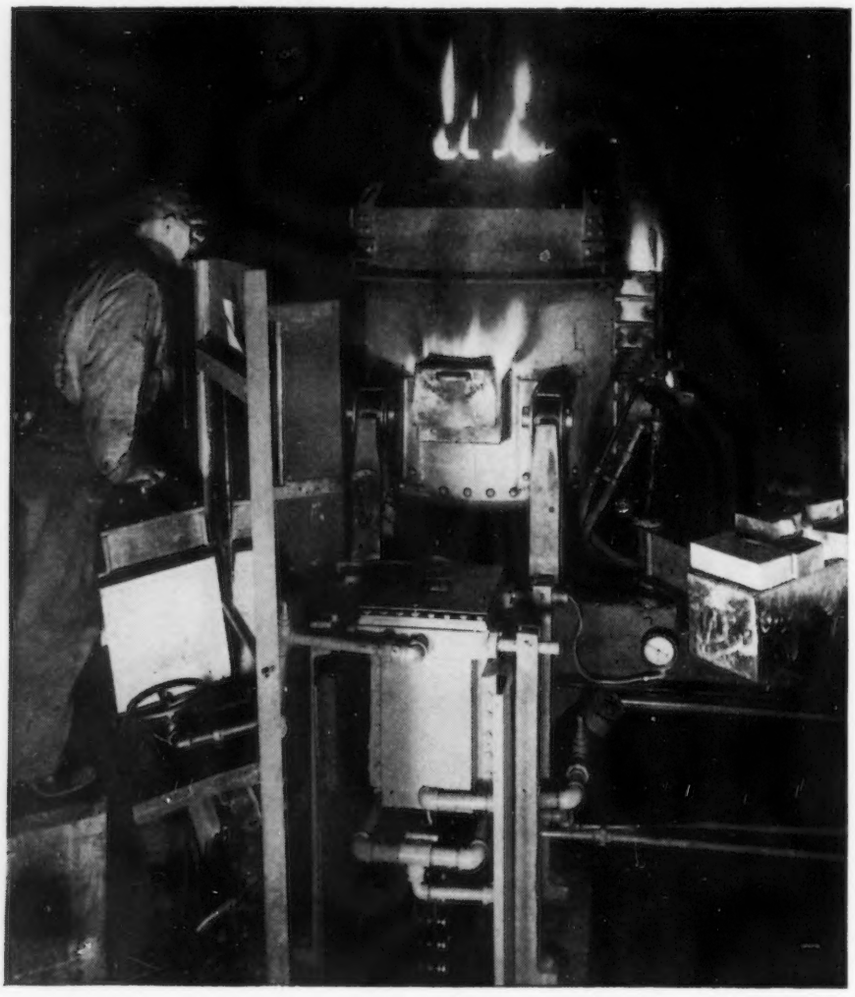
hans ingot also is often blemished by barely visible surface rings (probably due to the mold movement), although the rings are only skin deep and certainly do not carry into the metal. But still, it is possible that the rings might give rise to some consumer resistance if the ingots were to be sold un-scalped.

Only several men are required to operate the Junghans machine—and these have little to do. It becomes quite a job to stay awake, what with the heat, the monotonous movement of the mold, and the constant low noise of the reducing gears on the one small motor operating the entire unit.

Junghans is currently experimenting with a variation of his machine to continuously cast composite metals. Also, tubes have been experimentally cast, the set-up for this purpose having a thorn extending down through the molten metal, the thorn moving cyclically with the mold. As for steel, Junghans himself is fully confident that his unit can easily continuously cast carbon and alloy steels, just as soon as he can get around to doing some serious work on that problem.

Williams at Latrobe

Undoubtedly the greatest amount of work on steel has been done by Edward R. Williams, president of Vulcan Mold & Iron Co., Latrobe, Pa., the continuous casting operations being carried out for well over a decade by a personal company, the Williams Engineering Co.



THE Williams continuous casting equipment, ready for an experimental run on steel. The piping on the mold (center) is for water cooling, and below may be seen several of the sizing rolls. Speed is about 10 ft. per min.

The Williams patents are concerned principally with mold design and method of mold cooling. Two patents are in existence (2,079,644; 2,187,720), and a third has been allowed and will be issued in about three months—it deals with mold lubrication. A fourth patent is pending.

The Williams process accomplishes the necessary heat removal by providing a very thin mold wall of high conductivity material (commercial drawn copper or brass tubing) through which heat can rapidly pass from the ingot, and by removing this heat extremely rapidly from the outside of the mold wall by means of water or other cooling fluid passed at high velocity along the surface. By removing the heat rapidly from the outer surface of the mold wall, a high temperature gradient is produced in the mold wall, which permits fast removal of the heat from the ingot. It is claimed that this instantaneously freezes the molten metal into a skin which shrinks away from frictional resistance and is sufficiently strong to prevent fracturing as it is moved along the mold wall.

The cooling water in the mold passes through passages which have very small clearance, the velocity being quite high. It has been found that a relatively small amount of water (such as 50 gal. per minute in a mold 30 sq. in. in cross-section) is sufficient to satisfactorily remove the heat from a steel ingot to enable it to be poured and withdrawn at a speed of 7 or more feet per min. The temperature rise of the water, under these conditions, is only about 20 F. deg. Since the coefficient of the conductivity of the metal being poured will permit heat to be removed from it at a certain maximum rate, it is stated that the speed of heat transfer through the mold wall and removal therefrom does not need to exceed this rate.

The Williams mold does not move. As the billet or ingot emerges from the bottom it passes through a series of sizing rolls that prevent bulging of the walls by ferrostatic pressure from the molten interior. Water sprays surround these sizing rolls and the ingot is quite cool when it gets down to the pinch rolls. The entire setup may be seen in the color photo on page 35 (which shows the exit, below), and the other photo on this page (which shows the top, pouring). Williams frequently uses mold lubrication to increase speed of casting. The lubricant is introduced at the top along the mold wall, the quantity being controlled by the speed of the pinch rolls drawing the continuous billet out.

Williams has cast only experimental lengths, but for steady production plans to cut off the billets into specific lengths by means of a saw (as does Junghans) or by means of an oxygen lance for high alloy steels. Most of the

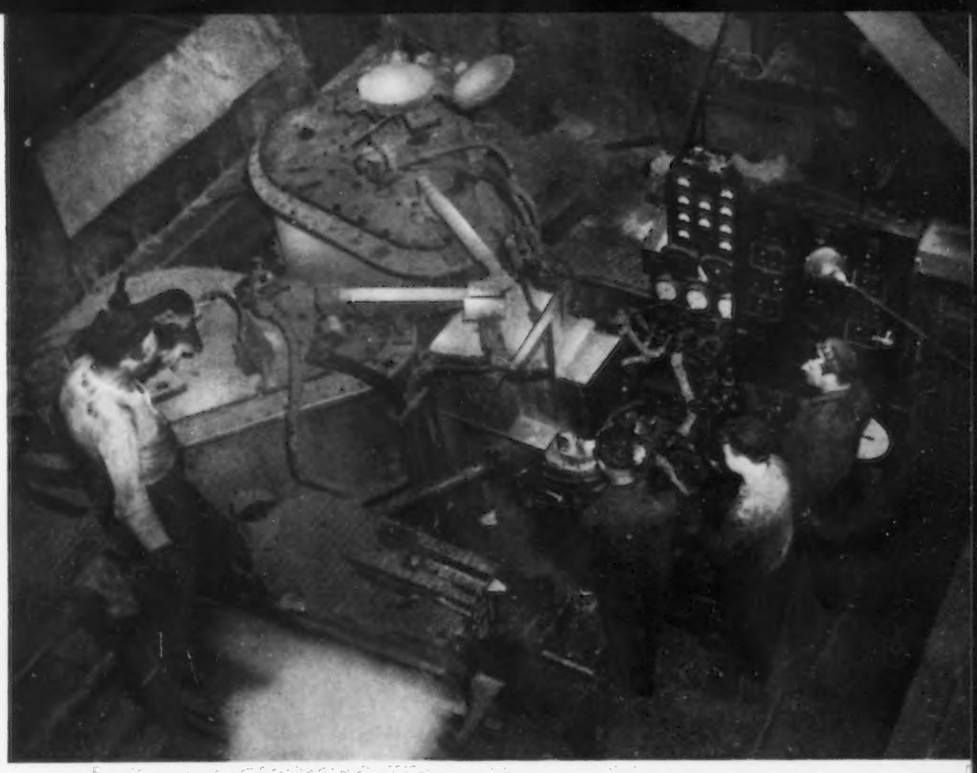
experimental steel casting has been 6-in. rounds and rectangular billets measuring 4 x 8½ in., and squares measuring 4 x 4 in. The steel being cast in the photo on page 35 had quite a high alloy content—the surface was somewhat blistered, but not badly so. Stainless steel likewise has frequently been cast experimentally. Ingot structure for the most part was satisfactory, and the steel has been rolled out into satisfactory commercial grade rod and strip.

So far the Williams machine has been given no steady trial over a long run on steel. A small unit is currently operating on copper alloys in the plant of Bridgeport Brass Co., and preliminary reports indicate fairly satisfactory performance.

For his process, continuously casting steel, Williams claims the steel industry has a means of eliminating piping and segregation with consequent great improvement in metal yield. Also control of the solidification (and structure) of the ingot is provided by the cooling sprays (or a tempering chamber). Williams also visualizes the continuous casting of semi-finished shapes, as for instance an I-beam; and composite metals, by feeding an ingot already made into a mold around which molten metal is poured; and tubing, by providing a stationary mandrel in the forming mold.

As already mentioned, Williams' patent activities have been directed primarily toward mold design and method of cooling, believing that for steel particularly the heat exchange must necessarily be fast and closely controlled. The copper mold apparently stands up well under the temperatures and erosion encountered in handling steel, as the same mold has been used many times in pouring experimental heats, with no apparent deterioration of the mold wall. In fact, Williams has demonstrated the rapid heat transfer in the mold wall in a very dramatic way—a scratch has been made in the wall and filled with solder, after which a heat of steel is poured through the mold. Later examination has shown the solder still intact in the scratch.

Despite the many experimental steel heats poured by Williams, the development of his machine seems now to be following the pattern set by other machines—that is, it is finding its first serious commercial trial in non-ferrous metals, as witness the present installation at Bridgeport Brass Co. Perhaps later the machine will shift from the non-ferrous field to a serious commercial trial for steel. A number of makers of carbon steel who habitually handle small heats have shown interest in the process. However, more likely it is conceivable that those makers of high alloy steels and certain types of stainless steels may see in this process a possible means for eliminating present high scrap losses and a more flexible method of handling small tonnage orders. Even so, a great deal of additional experimentation will be necessary before such a procedure could be established on a competitive metallurgical and commercial basis.

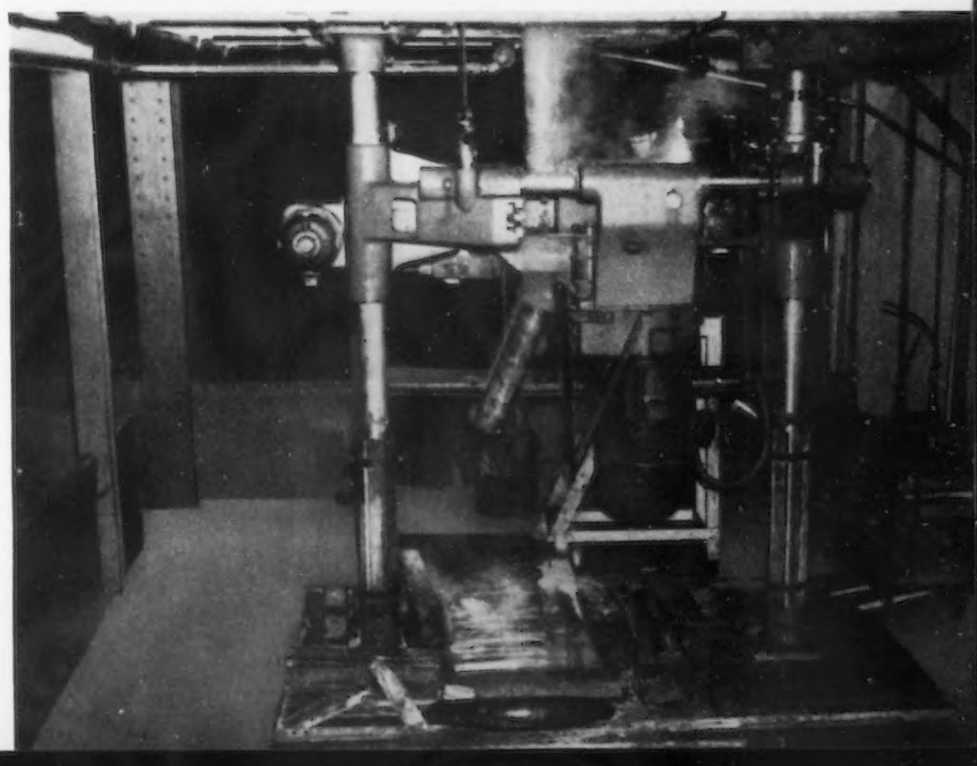


THE Junghans machine (top view) casting 7⅞-in. brass billets continuously at Scovill Mfg. Co., the speed being about 1 ft. per min. One of the two holding furnaces (left) feeds molten metal into the small reservoir (center) from which it passes by gravity feed into the water-cooled mold (lower center).

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Eldred, Poland, Et Al.

Whereas both the Junghans and Williams molds are metallic, with consequent rapid thermal exchange, the system first proposed about 15 years



THE Junghans machine at Scovill, showing cut-off equipment below floor level. The 7⅞-in. brass billet (upper center, with steam coming from surface) is cut into specific lengths by the saw (center), and these lengths drop into a chute.

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ago and steadily refined since that time by Byron E. Eldred[3] employs a forming chamber of dense graphite (radio carbon is excellent), carborundum or other material resistant to heat and corrosion. Around or adjoining this forming chamber is a cooling chamber through which water is circulated, and after the continuously cast rod or billet leaves the machine it may be further cooled by means of sprays, this latter being typical of all processes. The patent drawing of Eldred's machine is reproduced on page 34, this particular set-up showing three forming chambers drawing from the one furnace. Various features of the Eldred machine are covered in patents 1,868,099; 2,048,733; 2,048,734; and 2,135,465, and licensing is under the direction of the Continuous Casting Corp., New York.

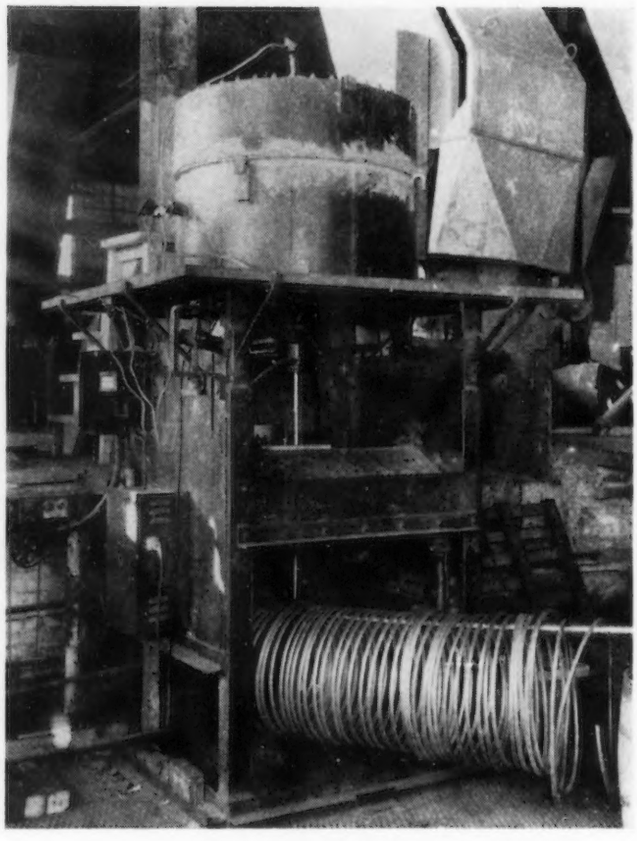
The use of the particular die material, the design of the forming die (which is varied for different metals, temperature conditions, etc.), and location and design of the water cooling system are all features of the Eldred machine differing from the two already described. As regards the physical-thermal changes taking place in the forming chamber (die), Eldred presents some rather recondite observations. For instance, one of many claims in his patent specifications deals with "method of casting metal shapes which consists in continuously supplying molten metal to an open ended forming chamber, having congealed metal in the lower portion, congealing additional metal thereabove by withdrawing heat therefrom substantially solely through the congealed metal, removing the congealed metal and cooling the forming chamber to maintain a substantially constant temperature gradient therein."

Eldred has explained that his process separates the removal of super-heat and latent heat progressively in quantitative timed relationship. However, the exact action be what it may, there is no denying that the Eldred process turns out beautiful metal. The crystalline structure can be controlled, and usually the rods or billets are turned out with crystals orientated in the longitudinal direction. The crystals may be of quite enormous size, and in one instance a copper rod was produced with a single crystal 32 ft. long. The metal structure is like throughout—this is demonstrated on the subsequent mechanical working of the metal, which shows plainly an even deformation throughout the entire cross-section. The metal is gas-free and very dense (copper density is 9.00, compared with the usual 8.934), and frequently has exceptional mechanical properties as-cast. Also, the metal surface is quite smooth, and scalping (as employed in the prior art) is not necessary before additional hot or cold working.

In general, the output of an Eldred unit is smaller than, say, the Junghans or Williams machines. A 1-in. rod, for instance, might cast at the rate of less than a foot a minute. This slowness might be anticipated on inspection of the machine design and the die material, what with the likely sluggishness of thermal exchange for the latter. But, it is really this slowness of production that is partly responsible for the metallurgical excellence of the metal. Eldred attempts to increase the output of a particular unit by putting multiple forming dies on one furnace, but for that matter the slowness of casting is not considered particularly bothersome—for the sphere of application of the machine is judged as being predicated on the quality of product, excellence of surface finish, and ease of operation of the machine.

One of Eldred's earliest experimental machines was at Bridgeport Brass Co. in 1932, casting a ¾ to 1-in. single copper rod out of the bottom, as shown in the photo on this page. A much larger machine was installed experimentally in 1934 at Scovill Mfg. Co., and, as shown on the opposite page, it cast a 6-in. round billet (cupro-nickel) continuously out of the side of the furnace, rather than out of the bottom.

At the moment, no Eldred machine is operating commercially, although last year the Aluminum Co. of America secured an Eldred license, probably to avoid interference with their particular process of continuous casting. Eldred believes that his method has an attractive future in large plants producing great quantities of commercial metal, although he particularly believes that many machines may find wide usage as converting units in small plants. For instance, a machine with one operator could work continuously in a scrap yard converting non-ferrous scrap of known analysis into rods which would be salable in the open market. For the most part, Eldred sees his machine as a producer of smaller



ONE of the earliest of Eldred machines, shown here casting copper rod (¾ to 1 to ¾ in. in diameter) at the plant of Bridgeport Brass Co. in 1933. Speed was 5 or 6 in. per min., for 24-hr. runs. Occasionally the operator looped cast rod to form the long coil at the bottom.

[3] Byron E. Eldred, who is 67 and looks 50, a retiring individual and a little on the temperamental side, could perhaps be designated as a professional inventor, but certainly an inventor of considerable renown. Among his many inventions are Dumet, the low expansion alloy used for lead-in wire in incandescent lamps, bought in 1916 by General Electric for what was then supposed to be the highest price ever paid for a single invention; also, glycol, purchased by Union Carbide & Carbon Corp., and now marketed as Prestone; also, production of basic material for manufacture of novocaine during the World War; also, the optical light slit, now used universally in sound recording euipment.

size rods or simple shapes, say less than 2 in. in diameter, as opposed to the sizable cross-sections handled by Junghans and Williams machines. The Eldred machine does not use a die lubricant, and most of the work has been done with non-ferrous metals. But, the casting of ferrous metals would appear to involve no insurmountable difficulties, in view of the excellent heat resistance of the graphite die used.

At the plant of the American Smelting & Refining Co., Rahway, N. J., a continuous casting machine has been in operation for a year and a half, steadily turning out an oxygen-free (phosphorized) copper billet, 3 in. in diameter, which is sawed into 50-in. lengths for sale on the open market. Most of this material (after scalping) has been going to piercing machines for the production of tubing. A. S. & R. seemingly is extremely satisfied with this mode of production, as opposed to conventional casting practice, and claims that the billets continuously cast are preferable because of minimization of surface defects in the finished tubing, the elimination of porosity in the metal, high density of the metal, and the close dimensional tolerances possible. So far, A. S. & R. has made nothing but round billets commercially, but it has several times been stated that consideration was being given to the continuous casting of simple shapes.

The A. S. & R. machine apparently operates under the Poland-Lindner patent (2,136,394), a sketch of which is shown on page 33. The patent deals with the continuous casting of copper and copper-base alloys, and although various designs of forming chamber and cooling chamber are detailed, the reader will note from the sketch that the Poland and Eldred designs show considerable similarity. As regards the thermal transfer in the mold chamber, Poland-Lindner specify "cooling the metal by extraction of heat through the die walls and continuously withdrawing the solidified metal . . . not withdrawing the heat down the previously congealed casting." The mold material is a "refractory, heat conducting material, which is non-wettable," and is usually graphite of extreme density or boron carbide (B_4C), both of which should be easily machinable and take a very smooth finish.

No lubrication is used in the A. S. & R. machine. The die itself may be about 7 or 8 in. in length and the speed of casting is not very high, say on the order of 8 in. to 1 ft. per min. for the 3-in. diameter billet.

The Aluminum Co. of America has cast continuously in commercial production for some time in several of its plants, one unit being at New Kensington, Pa. The company has an Eldred license, but the machine is of its own design. The process has been changed several times, and the company does not permit visitors to watch it operate.

If the writer were to guess, however, he would suspect that a metal mold is used, the mold being stationary. Most of the production is perhaps 6 and 8-in. rounds, and quite sizable slab ingots measuring perhaps 24 x 12 in., the speed varying from a few inches up to a foot or so per min. Casting is intermittent in that one length is cast after which pouring is stopped until the ingot is removed to make way for another pour. Instead of using pinch rolls the ingot moves out of the mold and down through cooling sprays on a hydraulic elevator. Aluminum is none too easy to continuously cast as the metal passes through a mushy stage, which results in some folding-in on the surface. Scalping is thus usually necessary.

Thus the roundup of continuous casting machines, wherein the mold wall remains stationary in relation to the metal flow, is about completed. Another patent of this general type which might be of interest is that of D. K. Crampton (2,145,416) which relates to the continuous casting of rods, tubes, bars, etc. The British patent of F. J. Kohlhas likewise has created some interest. Also, Norman Goss, of Cold Metal Process Co., has experimented with a mold wherein a graphite lubricant is forced in through apertures in the mold wall during pouring, the object being to eliminate sticking and fracturing of the ingot wall. A certain amount of experimenting has been done with this machine, and the results have been moderately encouraging. Also, there has been considerable interest in this type of production in the U.S.S.R., and the Ter. Akopow method (certificate No. 29,000) suggests pouring of metal into an ingot mold, which consists of individual half forms which automatically open and close. This is similar to the Grenville Mellon system of the Continuous Casting Co. of Garwood, N. J., which was given an unsuccessful trial during the World War on 3-in. diameter and smaller bars of brass and other non-ferrous metals.

At the moment, the International Nickel Co. of Canada is believed to be experimenting with a process of this general type. Tamman and Moritz (Zeitschrift für Metallkunde, 1935, 5, 115) suggested the continuous production of thin wire not under 0.004 in. in diameter by chilling of fluid metal, but anticipated inherent difficulties in maintaining the nozzle. And Keller has suggested (Zeitschrift für Metallkunde, 1933, 15, XII, 115-226) the production of a sheet of metal where the chilled metal is pulled out of cooled slots. There have been still other suggestions advanced, but most of them never even approached actual trial and many are quite hazy as to details.

Ed. Note:—Next week this article will be concluded with a review of recent machines for continuously casting strip, with particular attention given to a new high speed unit for alloy steels.

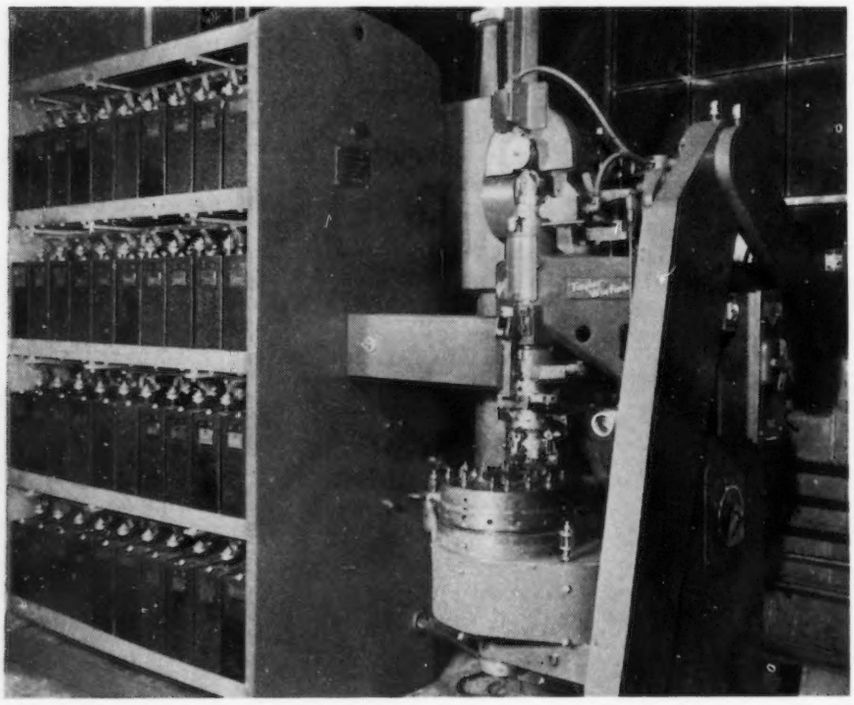
CONTINUOUS casting of 6-in. diameter billet (in this case cupro-nickel) at the plant of Scovill Mfg. Co., in late 1934. This experimental Eldred machine cast out the side of the furnace at a speed of several inches per minute. Most of Eldred's machines cast from the bottom.



Percussive WELDING

SOME recent developments have been made in the percussive welding process which increase the range of usefulness of this technique. Percussive welding is defined as a resistance butt welding process wherein electric energy is suddenly discharged across the contact areas to be welded and a hammer-like blow is applied simultaneously with or immediately following the electric discharge.

The need for a process such as the percussive method first arose in the electrical industry in the manufacture of lead-in wires for mercury arc rectifiers, where it was desired to join wires made of dissimilar metals, or where it was necessary to put platinum tips on nickel rods, or to join two highly conductive metals like copper and aluminum. The latest commercial units permit welding of this character, but do it on work of a larger scale—covering areas up to ¼ sq. in. provided this area is concentrated, such as in the form of a rod (0.564 in. maximum diameter or ½ in. square).



PERCUSSIVE welding machine with dial feed, made by the Taylor-Winfield Corp. for joining a ⅝ in. diameter tube to a disk, both made of SAE 1010 steel. These are the steel reinforcing pieces of a rubber engine mount. At the left is the condenser bank for storing up the charge for producing a high amperage arc an instant before the parts are brought together under impact. The cycle is completely automatic, and output is at the rate of 30 assemblies per min. or 1800 per hr. Operating guards are not in place.

These new machines, known as Vanco process percussion welders, are being built by the Taylor-Winfield Corp., Warren, Ohio. However, the patents are owned by the Vanco Products Co. of Detroit, from whom a license to use the process must first be obtained before the equipment is put into practice. The particular patent involved is No. 2,159,916, issued to Alfred Vang, of Detroit, on May 23, 1939, and assigned to the Vanco Products Co., a firm formed by Mr. Vang's financial backers during the course of the development. Later an agreement was entered into with Taylor-Winfield whereby the Vanco company agreed to work with it exclusively in the development of production equipment for practicing the process.

Taylor-Winfield has introduced a number of refinements in design. The first machine produced was a high production, special-purpose type with dial feed. It had an output of 30 completed pieces a minute. Since then a more general-purpose machine has been introduced, which will be described in detail later.

Up until now percussive welding machines have not been commercially available, although the process has been in use for over 25 years. In 1913, L. W. Chubb, at present director of the research laboratories of Westinghouse Electric & Mfg. Co., obtained patent No. 1,066,468 on a process of percussive welding in which the energy stored up in a high capacity condenser is discharged through the points to be welded when they are brought into

Metals may be joined, despite great differences in mass and thermal conductivity. Consequently, the automobile and other industries are finding this technique of particular value in obtaining unusual welds.

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By FRANK J. OLIVER
Associate Editor, The Iron Age

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contact with force considerable enough to obtain a forging effect. Chubb used this technique in the welding of lead wires running in size from Nos. 25 to 13 B. & S. gage and employed condensers of 1200 to 1400 microfarads capacity to obtain a tremendous amount of energy relative to the size of the work.

The metals to be welded were brought together initially with a point contact, by abutting the chisel edges of nipped wires at right angles to each other. Impact was provided by the weight of a falling carriage and chuck for one of the wires to be joined. The voltage used—about 200 volts at start—was so low, however, that current did not flow between the metals until they were brought into actual contact at the instant of impact. The sudden release of energy caused a small explosion and actually vaporized some of the metal, a fact that explains how sound welds were obtained in aluminum, since oxidation of the surfaces was prevented by the vapor shield. An oscillatory discharge of the condenser was produced with a current peak of about 500 amp. at the top of the first half cycle.

High Voltage Used

The Vanco process of electric percussive welding, although employing essentially the same elements as the Chubb machine, works on an entirely different principle, and the values of voltage and current are markedly different. Mr. Vang conceived his idea after observing the accidental welds that are produced within contactors and switchgear as a result of arcing or when high voltage electric lines are short-circuited. In the Vanco process, the current used is of sufficiently high voltage (4000 to 5000 volts) so that an arc is formed between the two metals being welded in the brief interval before they actually come into contact with a hammer-like blow, and it is the heat from the arc that brings the surfaces to a molten state rather than the resistance to current flow at the contact points or surfaces.

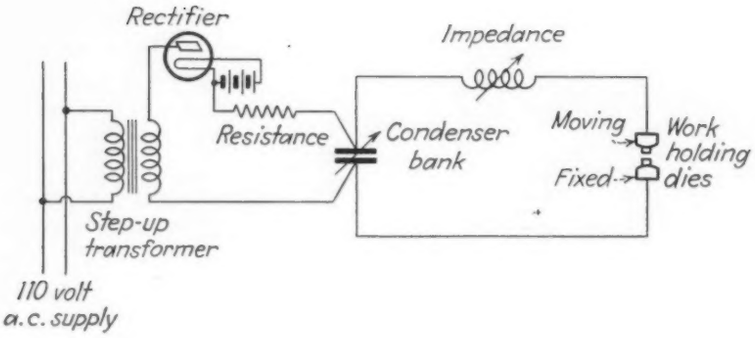
Furthermore, in the Vanco process the surfaces to be welded are preferably flat or such that a surface-to-surface contact is made between the metals. In actual practice, one component is held stationary in a fixture and the other is held in a movable slide retracted against spring or air pressure. Upon releasing a trigger, one piece moves toward the other rapidly, and when it reaches a distance depending upon the voltage, the arc breaks down across the gap and in less than a thousandth of a second later the two surfaces are brought together while they are still molten. During the arc, the current oscillates positive and nega-

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GENERAL purpose percussive welding machine suitable for joining dissimilar metals in rod form, such as the welding of high speed steel drill rod to a carbon steel shank without flash. The guards are shown up as when loading the dies. A number of safety interlocks have been provided to assure absolute safety to the operator when the high voltage arc is discharged.

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SCHEMATIC diagram of the electrical hookup for producing percussive welds by the Vanco process. Line voltage is first stepped up in the iron core transformer, then rectified in a vacuum tube unit for charging the condenser. Discharge of the condenser takes place in less than a thousandth of a second when the two ends of the work are brought close enough for the air gap to break down. Contact under impact immediately follows.



PHOTOMICROGRAPHS of typical Vanco welds, both magnified to 250 diameters. At the left, steel (left) is shown joined to copper (right). At the right, copper is shown joined to copper. The growth of new crystals across the weld line can be seen.

tive, decreasing in amplitude at a rate depending on the resistance of the circuit, which includes the varying resistance of the joint itself.

To get the greatest heating from the oscillatory current flow, it is necessary not to have the metals come into contact until after the end of one complete cycle, because the spark jumps from a point on the positive electrode to a large surface on the negative electrode and then reverses itself. Hence at least one full cycle must be completed to make each work element a negative electrode so that the entire surface of each electrode becomes molten. The ideal time for the physical contact is at the end of the second cycle so that a slightly greater depth of penetration of heat is obtained. In practice, a balance must be struck between speed of approach of the movable portion of the work and the frequency of the oscillatory wave set up by the constants of the circuit.

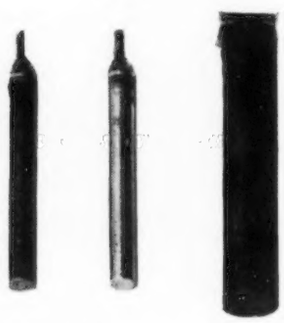
No Flash Produced

On the other hand, the force of impact must not be such as to create a flash of metal or to upset the ends of the work. In fact, the dial feed type machine referred to was built not only to weld a disk and tube of SAE 1010 steel in very fast time, but also to do the job without producing flash. In any event, flash is at a minimum, since only the surface of the metal is brought to the molten state and a truly surface weld is produced. Heat-treated metals therefore can be welded without disturbing the physical properties of the metal right up to the weld.

The schematic wiring diagram indicates the method of producing such an arc from an ordinary 110-volt, 60-cycle a.c. circuit. The voltage is first stepped up through a suitable iron core transformer and the high voltage current is rectified through a conventional vacuum tube since the condenser can be charged only with direct current. A resistance is inserted in the line to limit the rate of charging the condenser bank to a few amperes, taking 1 to 2 sec. to bring the bank up to full charge. In the Taylor-Winfield apparatus, a conventional spot welding timer control is employed to cut off the primary current after the condensers are fully charged. The capacity is 800 microfarads. To weld two round bars of dissimilar metals, ¼ in. in diameter, the condenser is charged to 4300 volts. Discharge of the condenser takes place automatically when the work trigger is released.

General-Purpose Rod Welder

With reference to the general-purpose bar type welder, the two pieces are solidly clamped in suitable dies, one being stationary and the other being held back against spring or air pressure, with the surfaces to be welded about ¾ in. apart. After the trigger is released, the movable die shoots forward and when the ends of the work pieces are about 1/16 in. apart, at 4000 volts the air breaks down and an arc is established across the gap. As indicated previously, the current wave set up is oscillatory in nature, of a frequency of about 5000 cycles per sec.,



TYPICAL applications of the Vanco percussive welding process to the joining of dissimilar metals. Left: Stellite tip to bronze valve stem; middle, Stellite tip to stainless steel valve stem, and right, silver graphite contact disk to copper rod stem.

and with a peak on the first half cycle of about 70,000 amp., rapidly decaying to zero, however. In fact, the mass of the moving system and the driving pressure is so adjusted that at the end of about 0.0005 sec. after the breakdown, the parts are brought into mechanical contact. Several cycles of the arc will have taken place by this time, however, and the metallic surfaces will have been heated to a high temperature just before contact. The impact produces the weld before any cooling can take place. In fact, the action is so rapid that practically no heat flows into the parts being welded and they feel hardly warm when removed from the dies.

This extremely rapid action, with absence of conduction of heat away from the surfaces being joined makes it possible to weld together parts with considerable difference in mass and also in thermal conductivity, factors that often cause great difficulty in making welds by conventional resistance methods. In the Vanco process, the electrical resistance of the work pieces plays very little, if any, part in the variation of the heat developed in making the weld, and this is why it is possible to weld materials of such diverse properties as copper and stainless steel.

In making a weld by this process, flat surfaces are necessary, a condition that is often advantageous since it often eliminates a prior operation, such as the preparation of a nib required in projection welding.



RESULTS of a destructive test on a square head stud welded to a steel disk by the Vanco process. Unlike a projection weld, which is round, the weld area extends to all four corners.

Some possible applications of the Vanco process are:

(1) Welding of rods of dissimilar metals, such as aluminum to copper, brass to steel, Dowmetal to steel.

(2) Welding of threaded steel studs to Dowmetal die castings.

(3) Welding of silver contact tips to copper backups.

(4) Welding of Stellite tips to operating rods of either ferrous or non-ferrous material.

(5) Welding studs to steel plate of any combination of materials without the use of projections or of tubular sections to steel parts.

At the present stage of development, the parts to be welded must be two separate pieces, that is, a ring cannot be formed by percussive welding the two ends of a formed bar. The present limit on areas is approximately ¼ sq. in., but it is believed that much larger areas than this can be welded if sufficient capacitors are provided. These areas must be substantially concentrated, however, such as in rods or tubes. Equivalent areas in wide, thin sheets cannot be so welded.

CREEP AT HIGH TEMPERATURES

AT a recent meeting of the North-East (British) Coast Institution of Engineers and Shipbuilders, H. J. Tapsell presented a paper consisting of an account of the characteristics of the creep of metals together with a more specific description of the behavior of carbon and molybdenum steels suitable for superheated steam temperatures.

The manner in which the tensile properties such as ultimate stress and limit of proportionality are influenced by creep is first described, and then follows an account of the general behavior of metals during creep and of the influence of temperature, stress and time. The latter half of the paper deals specifically with the creep properties of carbon and molybdenum steels. Considerable variations in the creep properties of carbon steels of similar carbon content have been encountered, and this important feature is well illustrated by the data provided, which also show that steels containing from 0.13 to 0.4 per cent carbon have much the same properties around 840 deg. F. Molybdenum steels of similar composition also vary considerably in creep properties, although they are much superior to carbon steels. The addition of a small percentage of vanadium to molybdenum steels produces further improvement. The effect of heat treatment is described, particular attention being given to the effect of prolonged heating during service. Methods of estimating working stresses are given, and numerical data and curves show how experimental results may be utilized.

By ADOLPH BREGMAN
Consulting Engineer, New York

Metal Finishing

FINISHING DEPARTMENTS VS. CONTRACT WORK: A word of caution to the manufacturer who is having his metal finishing work done on contract outside of his own plant. It is very easy to slip into the fallacy that because spare floor space is available, it will pay him to install his own plating plant. The output seems to be large (the plater's bills are high!), power is available, floor space is available, labor and materials are used only when there is work to do, etc., etc.

This point of view is fraught with danger. If a finishing department is put in, it must, in all common sense, be debited with its share of the fixed charges of the plant. The outlay for power will immediately rise no matter how little work is done, if for no other reason, because of the demand charges. In slack times it is not possible to lay off all the labor—a minimum skeleton crew of skilled help must be maintained, in order to be able to go into operation without delay when business picks up again. And last, but not least, metal finishing operations are complex, involving numerous steps, requiring the supervision of skilled and experienced help (to say nothing of technical control) to prevent rejections, break-downs and any of the thousand-and-one headaches incident to this type of work. A slip in any single step will mean a vertical rise in the percentage of spoiled work. The manufacturer who looks askance at the profits "made out of him" by the contract plater should count his costs and risks most carefully before venturing on this (to him) uncharted and often choppy sea.

The figures below, based on experience[3], give a fair view of the financial problem involved in setting up a plating plant. The capital required for a plating plant is about $5,000 for every $1,000 per month output. In other words, a shop that does a business of about $25,000 per year requires about $10,000 in capital. This capital is used as follows:

Equipment	65 per cent	$6,500
Inventory	10 per cent	1,000
Cash & Accounts Receivable	25 per cent	2,500
Total	100 per cent	$10,000

This shop should run on 10 employees.

If such a concern plans to expand its business beyond $25,000 per year, it must have $5,000 of new capital for every $1,000 per month of additional business. Every employee added to the existing capacity force requires additional capital of about $1,000, of which $650 will go into additional equipment.

Granted, some of these figures may be revised for plating departments—accounts receivable, for example, may be eliminated. Nevertheless, additional cash must be allowed for, to take care of additional payroll which must be met weekly, to replace platers' bills, payable monthly.

Under only the most special circumstances should a company put in its own plant if it has less than $25,000 worth of finishing work to do per year.

Barrel Plating

One of the hazards in estimating barrel plating costs lies in the variety of conditions in which the material reaches the plating department, and also the variety of finishes applicable by this process, each finish calling for different operations, or in some cases, a different sequence of operations.

The Masters' Electroplating Association of New York analyzed the operations involved in barrel plating and the cost of the various components that enter into these operations. The calculations were practical in character, rather than theoretically analytical. Figures were used from the books of plants which had done barrel plating for some years, taking the actual expenditures per annum and reducing these expenditures to the cost per labor-hour.

Fundamentally, barrel plating work may be divided into two broad classes:

(1) *Bright plating*, requiring four

[3] Presented by Philip Sievering, Jr., at a meeting of the Masters' Electroplating Association of New York.

Costs

THIS article covers practical job and contract shop pricing methods, for still and barrel plating and finishing work. Whereas the fundamental consideration is the calculation of all direct labor, special considerations are expensive materials, such as precious metals, extra finishing materials, etc., and extra power for heavy industrial plates. Last week the author dealt with shop work records, the estimation of labor costs, and comparison of job shop and manufacturers' cost. In conclusion herein, attention is given to finishing departments vs. contract work, barrel plating, labor in bright nickel plating, etc.

principal operations: (1) tumbling, (2) plating, (3) barrel burnishing, (4) sawdust tumbling.

(2) White nickel or cadmium plating, requiring two principal operations: (1) plating, (2) sawdust tumbling.

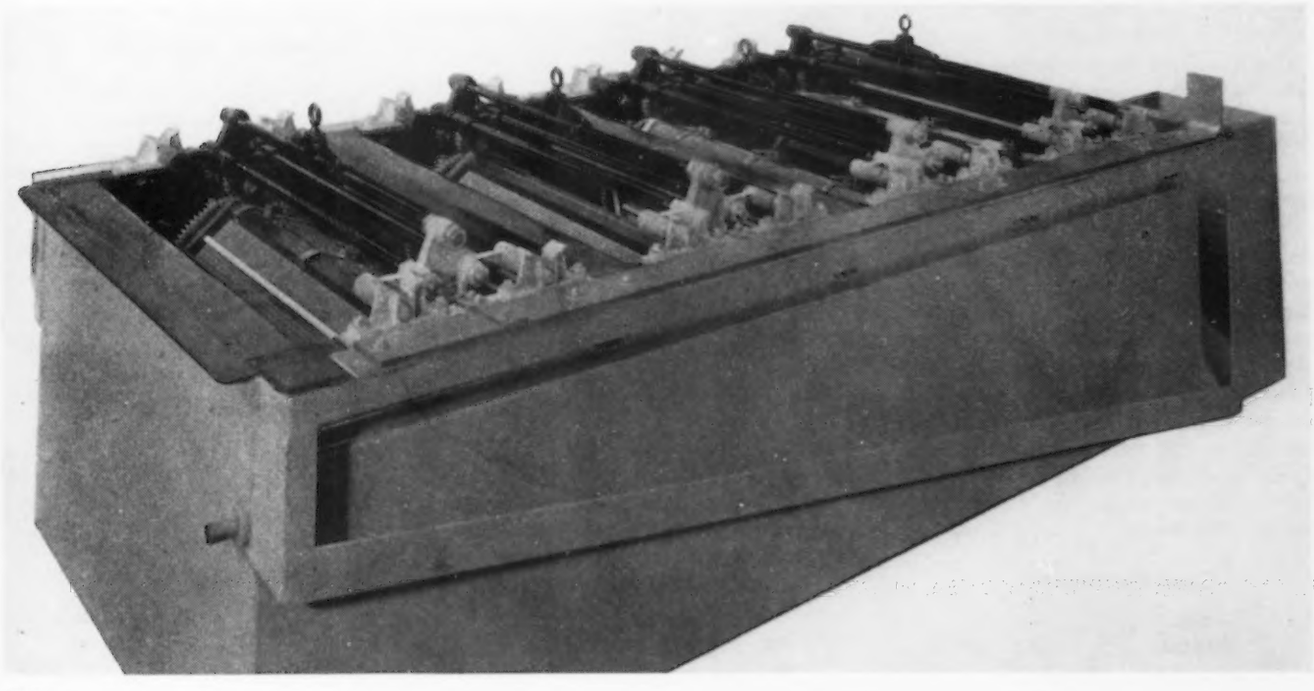
Another class of work might also be cited, intermediate plating, which calls for tumbling, plating and sawdust tumbling. But this type of work is often special in character, with the order of operations changed. In general, the costs fall between Classes 1 and 2.

It will be noted that in the operations just given, cleaning is not listed although it is, of course, a necessary step. It is omitted from these cost considerations because the time involved is small in comparison with tumbling, plating and ball burnishing, and it may, therefore, be considered a part of the plating operation.

The costs of these types of work follow, based on a plant operating a total of 25 barrels including tumbling, plating, ball burnishing and sawdust tumbling. The barrels are of average size, holding about 100 lb. of work. This plant requires three men, one plater and two boys. The costs are those which obtain in New York. The cost of the plant installed is estimated at about $15,000. In the following figures, for the sake of simplicity, small fractions, odd figures, etc., are dropped.

As previously stated, the output of a barrel plating plant varies. It varies with the type of work and also with the type of equipment. Some classes of work move freely in the barrel and can be handled in and out with a minimum of difficulty and delay. Others, nest, snag or "ball up" badly.

Also considerable progress has been



TYPICAL barrel plating tank for hot solutions, containing four barrels. Photo courtesy Hanson-Van Winkle-Munning Co.

made in the last few years in the handling of materials. Barrels can now be filled and emptied automatically by hoppers and moved from barrel to barrel by the same type of mechanism. Overhead trolley arrangements can be made to fit local plant conditions and to effect important reductions in labor costs by the proper layout.

For that reason several estimates of the labor time involved in handling barrel work are given, and the choice finally made represents a fair medium rate of operation.

According to one estimate the schedule of operations for one man is as follows:

Loading tumbling barrel	4 min.
Unloading tumbling barrel	8 min.
Loading plating barrel	8 min.
Unloading plating barrel	12 min.
Loading ball burnishing barrel	4 min.
Unloading ball burnishing barrel	12 min.
Loading sawdust barrel	4 min.
Unloading sawdust barrel	8 min.
Total handling time	60 min. = 1 hr.

The above represents the equivalent of handling four barrels per hr. or one barrel of bright plated work per hr.

Check by Production

In a typical case, four men working 8 hr. (total 32 hr.) loaded and unloaded:

48 tumbling and burnishing barrel loads (before and after plating).
38 plating barrel loads.
42 sawdust barrel loads.
128 barrel loads of all kinds.

The complete bright plating process takes 4 barrel operations, as listed Therefore, 4 men can turn out $\frac{128}{4}$ = 32 barrels of bright plated work per 8-hr. day.

Three men will turn out proportionally 24 barrels of bright plated work per 8-hr. day, or one finished barrel per hr. per man. This amounts to four barrel loads per hr. per man.

Another estimate gives the figure of 9 barrel loads per hr. per man, with the use of modern equipment. For the calculations to follow, therefore, the figure of 6 barrel loads per man per hr. is chosen as a fair rate under average conditions.

Costs Per Man-Hr.

(1) Labor:
1 foreman ..... 90c. per hr.
2 boys at 40c. per hr. = 80c. per hr.
Total $1.70 per hr.

TABLE VIII

Recapitulation of Costs Per Man-Hr.

Item	Cost per Man-Hr.
(1) Labor	$0.570
(2) Supplies:	
[a] Balls	0.026
[b] Soap	0.035
[c] Sawdust	0.013
[d] Cleaners	0.042
[e] Anodes	0.163
[f] Salts	0.010
[g] Linings	0.106
(3) Power	0.385
(4) Depreciation, interest on investment and repairs	0.444
(5) Insurance, taxes, etc.	0.034
(6) Rent	0.194
(7) Trucking and Shipping	0.481
(8) Office supplies, etc.	0.048
(9) Office help	0.087
(10) Executive's salary	0.385
(11) Miscellaneous, etc.	0.096
	$3.119

$\frac{\$1.70}{3}$ = 57c. per man-hr. average.

(2) Supplies:

[a] Balls are used up at the rate of about 45 lb. per month, at 30c. per lb. = about $13.50 per month.

Three men work 8 hr., 5 days per week and 4⅓ weeks per month = about 520 working hr. per month.

$\frac{\$13.50}{520}$ = about 2.6c. per man-hr., cost of balls.

[b] Soap is used up at the rate of about $18.00 per month.

$\frac{\$18.00}{520}$ = about 3.5c. per man-hr., cost for soap.

[c] Sawdust cost is about $7.00 per month.

$\frac{\$7.00}{520}$ = about 1.3c. per man-hr., cost for sawdust.

[d] Cleaners, potash and cyanide, cost about $22.00 per month.

$\frac{\$22.00}{520}$ = 4.2c. per man-hr., cost for cleaners.

[e] Anodes. Annual consumption was about 1000 lb. of nickel and 1000 lb. of cadmium. Total cost at this time was an average of about 50c. per lb., $1,000 per year, or about $85.00 per month.

$\frac{\$85.00}{520}$ = 16.3c. per man-hr., cost of anodes.

[f] Salts. Annual consumption is about 1 barrel of nickel salts of 450 lb.; total cost, about $60.00 per year or $5.00 per month.

$\frac{\$5.00}{520}$ = about 1c per man-hr., cost of salts.

[g] Linings for Barrels. Cost of new linings required is about $55.00 per month.

$\frac{\$55.00}{520}$ = 10.6c. per man-hr., cost of barrel linings.

(3) Power:

This particular plant uses about 4000 kwhr. per month, which at rates obtaining in the district, about 5c. per kwhr., amounts to $200 per month.

$\frac{\$200}{520}$ = about 38.5c. per man-hr., cost of power.

(4) Depreciation, Interest on Investment and Repairs:

This plant cost about $15,000 to buy and install complete.
Depreciation at 10 per cent is $1,500 per year.
Upkeep and repairs at 2½ per cent is $375 per year.
Interest on investment at 6 per cent is $900 per year.
Total = $2,775.

$\frac{\$2,775}{12}$ = about $231 per month.

$\frac{\$231}{520}$ = about 44.4c. per man-hr., cost of depreciation.

(5) Insurance, Taxes, etc.:

Compensation insurance, fire insurance, payroll taxes, etc., total in this district, about 6 per cent of payroll.
6 per cent of 57c. = 3.4c. per man-hr., cost of insurance, taxes, etc.

(6) Rent:

Should be about $100 per month.

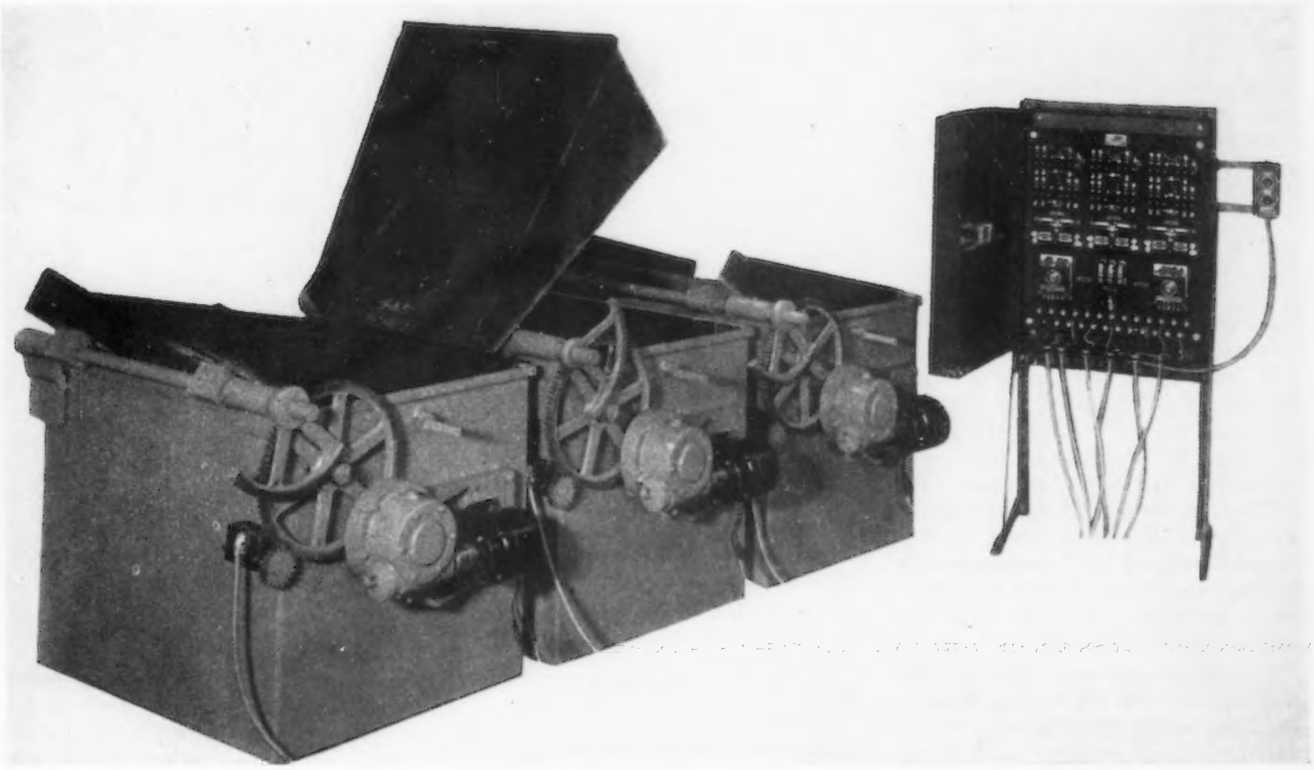
$\frac{\$100}{520}$ = 19.4c. per man-hr., cost of rent.

(7) Trucking and Shipping:

Cost of operating a truck, driver, depreciation, upkeep, gas, oil, etc., is about $250 per month.

$\frac{\$250}{520}$ = 48.1c. per man-hr., cost of trucking and shipping.

(8) Office Supplies, Telephone, etc.,



THIS type of barrel plating equipment cuts work-handling costs. A three rinse tank unit showing driving mechanism. Any number of these units can be set in line and controlled from the instrument panel shown on the right. Photo courtesy Hanson-Van Winkle-Munning Co.

Total cost is about $25 per month.

$$\frac{\$25}{520} = 4.8\text{c. per man-hr.,}$$

cost of office supplies and telephone.

(9) OFFICE HELP:

This plant may be operating as a part of a larger organization, in which case it will use only a part of the time of an office worker. If it is operating independently, it can also manage with a part-time girl. Cost about $45 per month.

$$\frac{\$45}{520} = 8.7\text{c. per man-hr.,}$$

cost of office help.

(10) EXECUTIVE:

Salary allowed, $200 per month.

$$\frac{\$200}{520} = 38.5\text{c. per man-hr.,}$$

executive's salary.

(11) MISCELLANEOUS AND EMERGENCY:

Allowance is made for unforeseeables, emergencies, rejects, miscellaneous, etc., of $50 per month.

$$\frac{\$50}{520} = 9.6\text{c. per man-hr.,}$$

cost of unforeseeables, etc.

A recapitulation of all these costs is shown in Table VIII.

Estimating that one man will load and unload, on the average, 6 barrels per hr., and figuring that each completed barrel of bright nickel plated work represents 4 barrel operations, there obtains $\frac{6}{4} \equiv 1\frac{1}{2}$ barrels of completed bright nickel plated work per man-hr.

The cost, therefore, is $3.12 for 1½ barrels or $2.08 per barrel load, or 2.08c. per lb.

A point which must not be overlooked is that this figure of 2.08c. per lb. represents the cost when the barrels are loaded up to their full capacity—100 lb. Lots of less than 100 lb. will vary in cost, inversely with their weight. Also, work which is bulky and does not permit loading in the barrel up to 100 lb., will be proportionally more expensive, per lb. Odd weight shipments such as 340 lb. or 570 lb., for example, will result in one short barrel load. For strict accuracy, the short weight barrel must be charged for at the full barrel rate, that is, at a proportionally higher rate per lb.

White Nickel, Cadmium

This type of work requires about one-half the labor time of bright plating, calling for only two barrel operations. Hence the cost per labor-hour will be $\frac{\$2.08}{2} = \$1.04$ per barrel load.

ROLLING

By GEORGE SACHS
Case School of Applied Science, Cleveland

o o o

STRESS-STRAIN RELATIONS: The maximum reduction per pass in a mill (without front tension) is determined by the diameter of the rolls, the surface conditions of the rolls, and the metal and the lubrication (if used). In hot rolling, a maximum reduction per pass of about 13 per cent of the roll diameter may be obtained, or if a 50 per cent reduction is required the stock may be not over one-fourth of the roll diameter. "Ragging" or "bossing" the roll surface of hot mills increases the attainable reduction but will produce a poor metal surface. Polished and lubricated rolls in cold mills, on the other hand, will reduce the metal by 30 per cent only if the thickness of the strip is less than 1/100 of the roll diameter.[14] However, old, rough rolls bite better and have a larger "angle of nip" than new rolls with a smooth surface.[15] The significance of biting and the angle of nip will be discussed later.

The same factors also determine the minimum thickness which can be economically rolled. The roll pressure invariably increases as the metal thickness is reduced. The rate of this increase depends upon the friction, and is generally small in cold rolling[16] and high in hot rolling[17], as illustrated in Figs. 7 and 8. If the metal thickness is reduced below a certain point, depending upon the specific conditions, the elastic spring of the rolls becomes so great that no reduction can occur.[18] Thus, polished rolls will not reduce steel to a thickness less than 1/2000 of the roll diameter.[19] The economical limit is probably about 1/500. In hot rolling, very high rolling pressures are required, according to Fig. 7, to roll light sections, and the minimum ratio between metal thickness and roll diameter is reduced to 1/50.

Therefore, without a power reel, very thin strips can only be rolled with very small rolls. The necessary strength has been procured by developing rolling mills with working rolls as small as 0.2 in. in diameter, supported by either 10 or 18 backing rolls (Fig. 1). Such mills will reduce very hard alloys to a thickness of 0.0001 in.

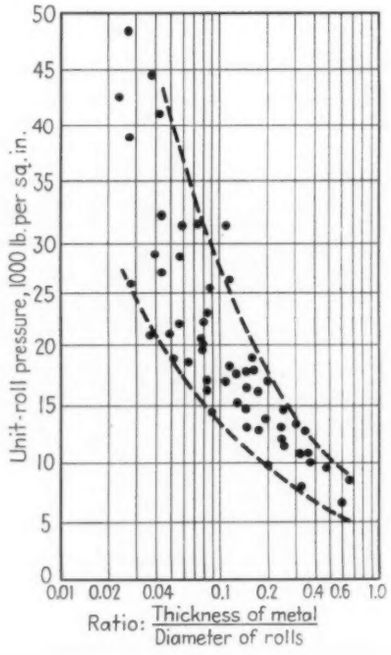
The addition of power reels, however, enables polished rolls with diameters as large as 20 in. and more to roll long lengths of strip down to 0.001 in. thickness and less.

The calculation of the forces and the work required for rolling can be based upon the assumption of a uniform deformation. The reduction of thickness is mainly converted into an increase of length which is effected uniformly in a strip or sheet except for a short section at each end.[20] This results in an overlapping back end or "fishtail" which may be avoided by using pointed ingots. There is also a small but definite lateral extension or "spread" of the strip, which is particularly important in the rolling of rods, sections, and composite inlaid materials. The spread is larger at the surface than in the core, and especially so with small reductions. Consequently, ingots generally have beveled edges in order to avoid laminations. The amount of the average spread for a given material depends upon many factors, such as the diameter and the surface conditions of the rolls, the amount of reduction, and the hardness of the stock. A simple equation, which approximates commercial practice, is:[21]

$$b_1 - b_o = e\,\frac{h_1 - h_o}{h_o}\,(L)$$

where:

b_o = width before rolling.



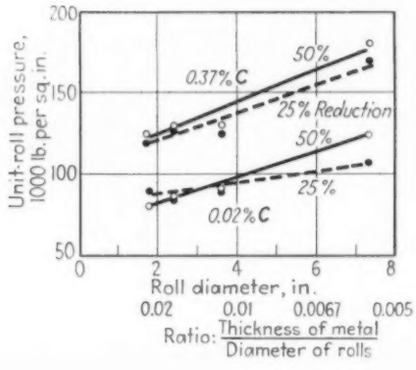
AT LEFT

FIG. 7—Effect of roll diameter on pressure in hot rolling of light sections. (Siebel.)

o o o

BELOW

FIG. 8—Effect of roll diameter on pressure in cold rolling strip steel, 0.040 in. thick. (Siebel.)



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[15] W. Lueg and E. Osenberg, Mitt. Kaiser-Wilhelm Inst. Eisenforsch., Vol. 15 (1933), pp. 99-105.
[16] E. Siebel and W. Lueg, Mitt. Kaiser-Wilhelm Inst. Eisenforsch., Vol. 16 (1934), pp. 105-112.
[17] W. Lueg and E. Pomp, Mitt. Kaiser-Wilhelm Inst. Eisenforsch., Vol. 17 (1935), pp. 63-76, Stahl u Eisen, Vol. 55 (1935), 1105-1113.
[18] W. Trinks, Blast Furnace and Steel Plant, Vol. 25 (1937), pp. 617-619, 623.
[19] J. D. Keller, Blast Furnace and Steel Plant, Vol. 25 (1937), pp. 1110-1113.
[20] G. Sachs, Z. Metallkunde, Vol. 19 (1927), pp. 189-195.
[21] E. Siebel, Stahl u. Eisen, Vol. 43 (1923), pp. 1295-1298.
[22] A. Spenlé, Stahl u. Eisen, Vol. 56 (1936), pp. 544-549.
[23] W. Lueg and O. Osenberg, Mitt. Kaiser-Wilhelm Inst. Eisenforsch., Vol. 15 (1933), pp. 99-105.
[24] H. Sedlaczek, H. Zapp and B. Stockbauer, Metal Industry (London), Vol. 54 (1939), pp. 459-462.
[25] E. Siebel et al., Mitt. Kaiser-Wilhelm Inst. Eisenforsch., Vol. 12 (1930), pp. 225-244; Vol. 16 (1934), pp. 35-50.
[26] H. Hoff and T. Dahl, Stahl u. Eisen, Vol. 53 (1933), pp. 593-604; Vol. 55 (1935), pp. 485-491.
[27] W. Lueg, Stahl u. Eisen, Vol. 53 (1933), pp. 346-352.
[28] W. Trinks, Blast Furnace and Steel Plant, Vol. 25 (1937), pp. 1005-1008, 1012.
[29] Th. v. Karman, Z. Angew. Math., Vol. 5 (1925), pp. 139-141. E. Siebel, Stahl u. Eisen, Steel Vol. 93 (1933), No. 22, pp. 27-29; No. 23, pp. 30-34; No. 24, pp. 28-34; No. 25, pp. 26-32; No. 26, pp. 24, 44-45; Vol. 94 (1934), No. 2, pp. 24-25, 43; No. 3, pp. 27-29.

SHEET AND STRIP...

b_1 = width after rolling.
h_o = thickness before rolling.
h_1 = thickness after rolling.

$L = \sqrt{r(h_o - h_1)}$ is the contact length between the metal and the rolls; r = roll radius; and C is a constant which has been found to be 0.31 to 0.35 for the cold rolling of steel, 0.36 for copper, 0.45 for aluminum, and 0.33 for lead. Another formula which seems to represent more nearly the commercial practice for steel is

$$b_1 - b_o = \frac{(h_o - h_1)\sqrt{b_o r}}{2.3\,(b_o^2 + h_o h_1)}$$

However, it has been observed that the various steels have different spreading tendencies. Ferritic nickel-chromium and silicon steels spread considerably more than plain carbon steels, while high sulphur free-machining and high speed steels spread less.[22] The spread is generally reduced as the rolling speed is increased, but again to different degrees for various steels. Rough rolls, characteristic of high friction, produce less spread than polished rolls.[23] The spread of aluminum, and magnesium alloys is dependent upon the rolling temperature[24] to a considerable extent.

LAST week the author presented details on the different types of rolling mills for hot and cold reducing of steel, the roll finish, and the metal problems involved. Herein, in conclusion, extensive calculations are given for the stress-strain relations involved in rolling.

Some investigations have been conducted to determine the relation of the speed of the rolling metal to the surface speed of the rolls. Generally (without an applied front tension) the stock moves somewhat faster in front of the rolls than the roll surface and considerably slower than that in the rear. There exists, therefore, a line parallel to the axis of the rolls where the metal has the same speed as that of the roll surface. The location of this "no-slip point" determines the speed of the metal in relation to the speed of the rolled surface (called "slip"). The slip at the exit or delivery end ("forward slip") is of importance as it controls the output. The slip increases with increasing friction and is related in a complicated manner to the reduction, having a maximum value at medium reductions when other factors are not varied.[25] The forward slip for steel also advances with increasing temperature. The value for the forward slip is:

$$W = \frac{V_s}{V_r} = 1$$

where V_s = speed of rolled stock, V_r = surface speed of rolls, and ranges from 0 to 10 per cent under commercial conditions.

The external force which characterizes most rolling operations is the pressure, which is transferred from the rolls to the stock. This pressure for different conditions has been extensively measured with special apparatus.[26] A piezio-electric gage has also been developed to measure the distribution of the pressure on the surface of the stock[27] (Fig. 9). The total pressure (P) can also be approximately calculated from the torque or rolling moment (M in in.-lb.) according to the formula (see Fig. 10):

$$P = \frac{M}{L} = \frac{M}{\sqrt{r(h_o - h_1)}}$$

The torque is also related to the power consumption

E (in hp.; 1 hp. = 33,000 ft.-lb. per min = 6600 in.-lb. per sec.):

$$M = 6600\,\frac{E}{\omega}$$

where ω = angular speed. A number of more or less complicated equations have been developed to calculate the roll pressure for steel under different conditions. However, the rolling relations are more complicated than can possibly be described by any mathematical equations.[28]

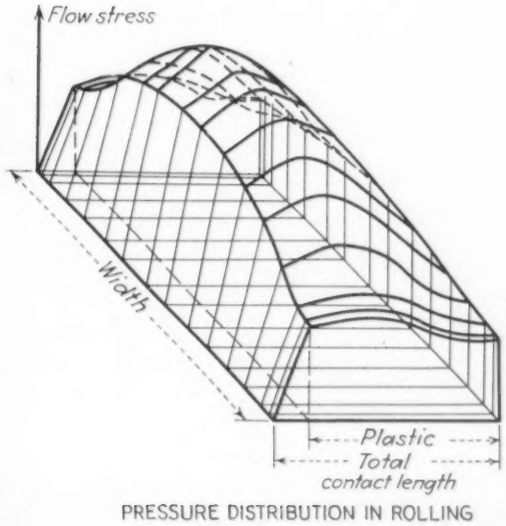
The fundamental analysis of the stress-strain relations during rolling is the only satisfactory method.[29] If friction is disregarded there is a simple fundamental formula for the power consumption which approximately represents any specific working process:

$$A_o = Vk\ln\frac{h_o}{h_1}$$

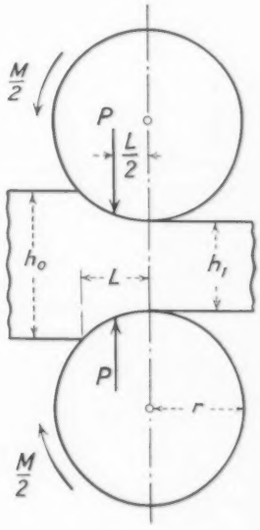
where, A_o = work expended
V = volume
k = flow stress
h_o = original thickness
h_1 = final thickness

BELOW

FIG. 9—Distribution of roll pressure in cold rolling. (Lueg.)

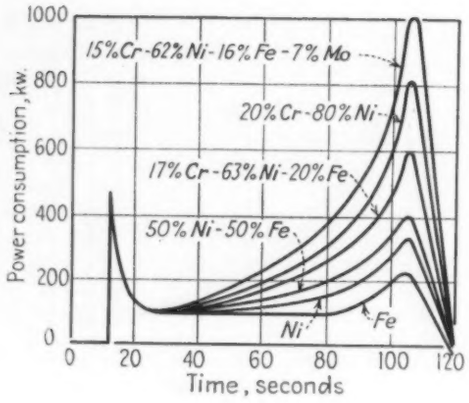


PRESSURE DISTRIBUTION IN ROLLING



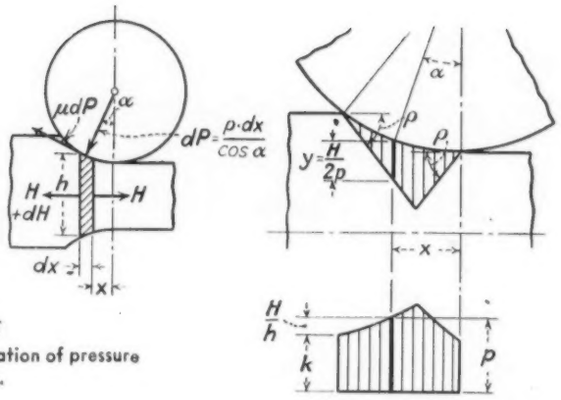
ABOVE

FIG. 10—Torque and roll pressure.



AT LEFT

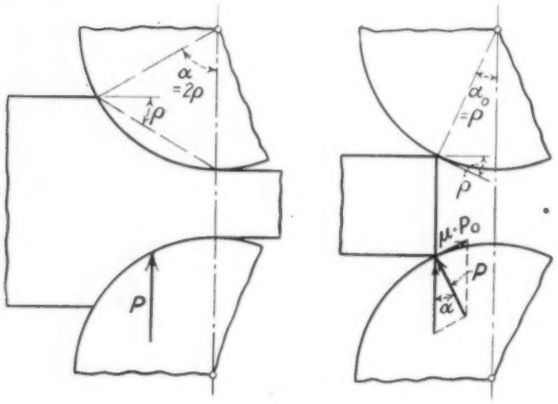
FIG. 11 — Total power consumption during hot rolling different metals in a continuous mill.



AT RIGHT

FIGS. 12 and 13—Calculation of pressure distribution.

The flow stress can be determined by compression tests under similar conditions of temperature and speed. In cold rolling, the flow stress, and correspondingly the roll pressure, may vary considerably for the different metals, 2000 to 5000 lb. per sq. in. is sufficient for lead, while up to 300,000 lb. per sq. in. are required to deform the hard tempers of austenitic stainless steels, which are the hardest commercial metals that are now cold rolled. In hot rolling, the difference in the flow stress of the various metals is smaller than that in cold rolling, and the maximum flow resistance (50,000 lb. per sq. in. offered by any metal[30]) is only a fraction of that for the cold rolling or stainless steel. Fig. 11 illustrates the different power consumptions required for various iron and nickel alloys, including some austenitic alloys characterized by a high warm-strength, during the hot rolling of ingot bars in a continuous mill.[31]



FIGS. 14 and 15—Biting capacity and angle of nip.

The frictionless power consumption, however, is only a minimum figure, and much higher values have been measured in commercial practice. The friction between the rolls and the stock is responsible for discrepancy. The effect of the roll diameter on the roll pressure, which depends mainly upon the value of the friction between rolls and stock, has been discussed previously.

The stresses in the metal and the roll pressure during rolling can be calculated by the following approximate method:

Fig. 12 shows the stresses in equilibrium in a section of a rolled bar (width = 1), where:

H = horizontal force.
p = specific roll pressure.
α = angle at roll surface.
δ = arc tan μ = angle of friction.

The direction of friction is not known, and thus gives the following equation:

$$dH + 2p\frac{dx}{\cos\alpha} \pm \mu 2p\frac{dx}{\cos\alpha}\cos\alpha = 0$$

$$\frac{dH}{2p} = -dx\ \tan\alpha \pm \tan\delta$$

This equation can be accurately solved. However, the relations can be also approximately ascertained by a simple graphical procedure (Fig. 13). The pressure (p) is considered as approximately constant and, for the purpose of integration, equal to the average flow stress (k), which can be determined by tensile or compression tests. At each limit x = O and x = L, the horizontal force = O, and the graphical solution gives two functions, corresponding to $+\mu$ and $-\mu$ respectively. The shaded area in the upper part

[30] G. Weddige, Stahl u. Eisen, Vol. 57 (1937), pp. 913-921.
[31] W. Rohn, Stahl u. Eisen, Vol. 49 (1929), pp. 1757-1760, 1793-1797.

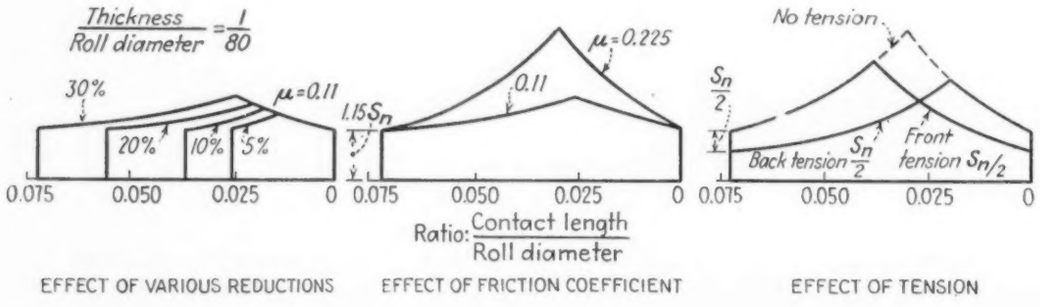


FIG. 16—Pressure distribution in rolling. (Nadai.)

of Fig. 12 gives the approximate values

$$y = \frac{H}{2p} = \frac{H}{2K}$$

and the pressure is represented in the lower part of Fig. 13:

$$p = k + \frac{H}{h} = k\left(1 + \frac{y}{2t}\right)$$

where t = thickness of the metal. (The relation $p - \frac{H}{h} = k$ assumes a constant shear stress during the flow of the metal.) These figures clearly show the no-slip point, i.e., where the friction changes its sign. These calculations do not consider the flattening of the rolls, which effect considerably increases the length of contact and therefore the roll pressure.[32]

Increasing the length of contact L to a value where $\alpha = 2\delta$ would shift the no-slip point to the boundary $x = O$. (See Fig. 14.) This is the limit up to which a metal can be rolled, assuming that the rolls have bitten the metal. However, if the rolls have to bite the bar, a different "angle of nip" exists which can be obtained from Fig. 15:

$$\alpha_o = \delta$$

Thus, about twice as much reduction can be secured by the pass as in biting. Frequently the rolling is started by tapering the bar, which reduces α until the rolling has sufficiently progressed, or sometimes by pushing the bar between the rolls by means of a pusher.

The importance of other factors can also be followed graphically. However, more accurate methods have to be used to obtain quantitative relations.[33] For comparatively large rolls, the maximum horizontal stress $\frac{H}{t}$ located in the center of the contact line, increases approximately proportionally to the coefficient of friction μ and the ratio $\frac{L}{t} = \frac{\text{contact length}}{\text{thickness}}$ (see Fig. 16). Front tension and back tension affect the pressure in the manner illustrated in Fig. 16.

The absolute values of the coefficient of friction under different rolling conditions have been given in a previous article.[34]

[32] W. Trinks, Blast Furnace and Steel Plant, Vol. 25 (1937), pp. 285-288.
[33] A. Nadai, Journal Applied Mechanics, (1939) June, pp. A54-62.
[34] G. Sachs, THE IRON AGE, Feb. 1 and 8, 1940.

Hardenability of Carburizing Steels

METHODS of selecting steels according to their response to a standardized carburizing and hardening cycle have been favorably regarded by the automotive industry, and their laboratories have been engaged in developing such selection methods. As a result of this activity a paper was published in 1938 by W. E. Jominy and A. L. Boegehold, of the General Motors Corp. research laboratories staff, entitled "A Hardenability Test for Carburizing Steel." The paper described a method of testing to determine hardenability.

Bulletin No. 320 of the Engineering Experiment Station of the University of Illinois, entitled "The Hardenability of Carburizing Steels," by W. H. Bruckner, which has just been issued, investigates the hardenability of known low and high-hardening steels of increasing alloy content in order to determine whether the Jominy method of rating the hardenability of carburizing steels was valid. An intensive study of a series of SAE 4615-4620 steels was then undertaken to determine the factors causing low hardenability.

Some of the findings of this research are as follows:

(1) The results of tests made on various SAE steels in the carburized condition indicate that differences in hardenability are determinable by means of the Jominy test.

(2) In general, the hardenability is greater the higher the alloy content of the steel. Specifically, for the SAE 4615-4620 grade of steel it has been found that higher hardenability is more often obtained when the alloy content is above 2.90 per cent and the chromium above 0.17 per cent, but the desired hardenability of 2½ in. is not assured by satisfying these limits.

(3) For the SAE 4615-4620 steels the indications are that an unfavorable distribution of the inclusions may be more effective in reducing hardenability than is a favorable chemical composition in stabilizing the austenite. It has been shown in the results cited in the bulletin that a series of steels with substantially the same grain size, chemical composition, carbide rejection habit (in McQuaid-Ehn microstructure), and the same amount of inclusions do not harden to the same extent when carburized, due apparently to the difference in the distribution of the inclusions, and possible chemical segregation associated with the inclusions in the various steels.

(4) It would appear, therefore, that, provided a marked reduction in the amount of inclusions or the extent of their dispersion could be made by suitable melting, deoxidation, casting, and rolling methods, without causing a change in the grain size, it would be possible to increase the hardenability of the fine grain SAE 4615-4620 steels.

(5) The result of comparisons made between the hardenability as found at the ⅛-in. distance in the Jominy bar and the hardenability found for 1-in. round carburized bars quenched in oil has shown that the hardenability which the Jominy test predicts is not entirely realized. There is a close correspondence of hardenability for the Jominy bar at ⅛ in. from the water-cooled end and for the oil-quenched bar at a depth of 0.026 in. The fundamental difference in the cooling rates over the cross-section for the Jominy bar and for a bar quenched by total immersion has been suggested as a possible reason for the differences in hardenability observed. The Jominy bar is so designed as to cool from the center of the cross-section with a slight temperature gradient, while the fully immersed bar cools from the outside surface and with a steep temperature gradient. The transformation of austenite therefore takes place in the latter case in a system of stress while the Jominy bar transformation takes place in a practically stress-free condition.

(6) The comparison of the hardenability of the Jominy bar at 2½ in. from the water-cooled end with bars carburized and cooled at the same rate was not made.

The same cooling rate as in the Jominy bar 2½ in. from the cooled end could be established in a bar larger than 1-in. round by quenching in oil or water and in a bar smaller than 1-in. diameter by an air quench.

In view of the discrepancies observed between the Jominy-bar hardenability at ⅛ in. and an actual quench of a carburized bar it is reasonable to expect a difference between the hardenability at the 2½-in. distance on the Jominy bar and that of a large carburized bar in which this rate of cooling is duplicated.

USING LAMPS FOR INDUSTRIAL HEATING

By HOWARD HAYNES
Nela Park Engineering Department, General Electric Co., Cleveland

A SYNTHETIC enamel is now being baked on file cabinets by the Steel Storage File Co., Cleveland, in just 5 min. Formerly an air dry finish was used and the time required to dry was 2 to 4 hr.

The new method involves the use of a simple tunnel containing less than 150 drying lamps. Also, a Dayton, Ohio, firm now bakes a high-bake synthetic enamel in 6½ min. The old time, using the same paint, was 90 min., and the Ford Motor Co.,* first large scale user of infra-red drying, dries the prime coat on its cars in 7 min., as compared with 30 min. in an oven at 250 deg. F.; the second coat requires 14 min. in a lamp tunnel as against 80 min. in a steam oven.

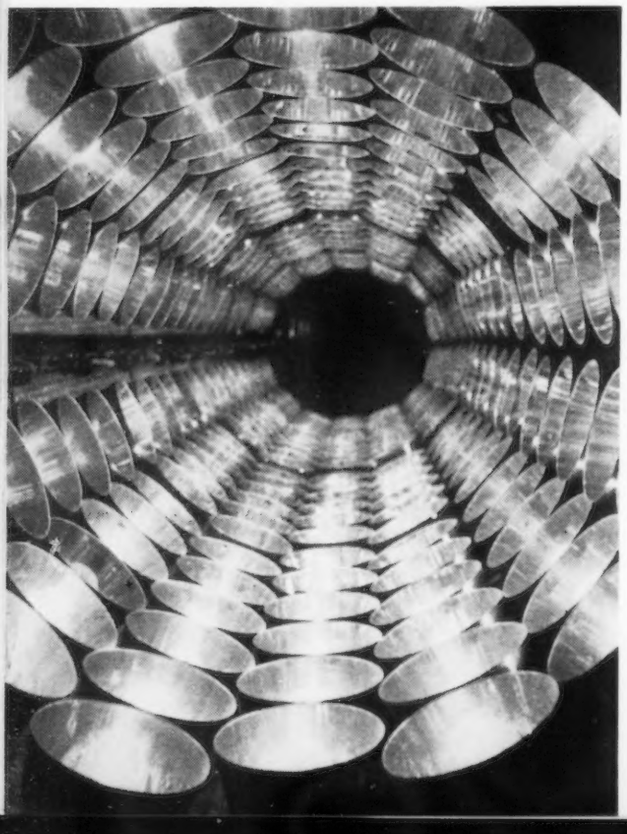
The use of lamps as a source of heat is not limited to the baking of paints nor is the time that is saved the only advantage. Actually, almost any process that requires heat may some day be done quickly, economically and with utmost simplicity by means of drying lamps. New uses for these lamps are constantly being found. Evaporating water from a great number of articles, including blueprints, photographic prints, fruit, clay, gummed surfaces, has all been successfully demonstrated and many installations of this type now exist. Installations for drying sheet steel after being bonderized or after receiving similar treatment are now in daily use in several plants. One large manufacturer uses drying lamps to expand metal parts before other parts are fitted into them.

This new and revolutionary heat source has many advantages, chief of which are:

(1) Great speed.
(2) Low installation cost.
(3) Very low operating cost.
(4) Flexibility.
(5) Ready for instant use. No power required during lags in production.
(6) Well suited to automatic control.
(7) Adaptable to modern conveyor systems.

Special lamps and reflectors have been designed for this service. Long-lived tungsten filament lamps of 250, 500 and 1000-watts are now available as are a wide selection of gold-plated and Alzak aluminum reflectors made by several manufacturers. Gold is an excellent reflector of infra-red energy

* The process and apparatus have been patented by the Ford Motor Co., which has licensed one or more equipment manufacturers to use it.



BAKING is done in this lamp tunnel in 7 per cent of the time formerly required. It is equipped with 250-watt drying lamps in 10-in. gold-plated reflectors.

as well as being relatively stable in a majority of industrial atmospheres. Alzak aluminum also is stable and is less expensive. It is, however, about 10 per cent less efficient in redirecting infra-red than a gold-plated surface.

The units are generally mounted on channels of conduit and the shape of the oven is designed so that the article being treated receives the energy as uniformly as possible. Drying lamp ovens are of three general types:

(1) Flat banks.
(2) Tunnels.
(3) Portables.

A flat bank of units might be mounted over a canvas conveyor belt over which travel small, relatively flat, metal parts that are freshly painted. If the finish is a high-bake synthetic enamel, temperatures around 400 deg. F. are generally required. This temperature and higher temperatures are now obtainable using the new higher wattage lamps. With the greater concentration of energy obtained with the higher wattage lamps, it is suggested that a woven wire belt be used. This belt should be as light as practicable, otherwise heat loss by conduction will be excessive.

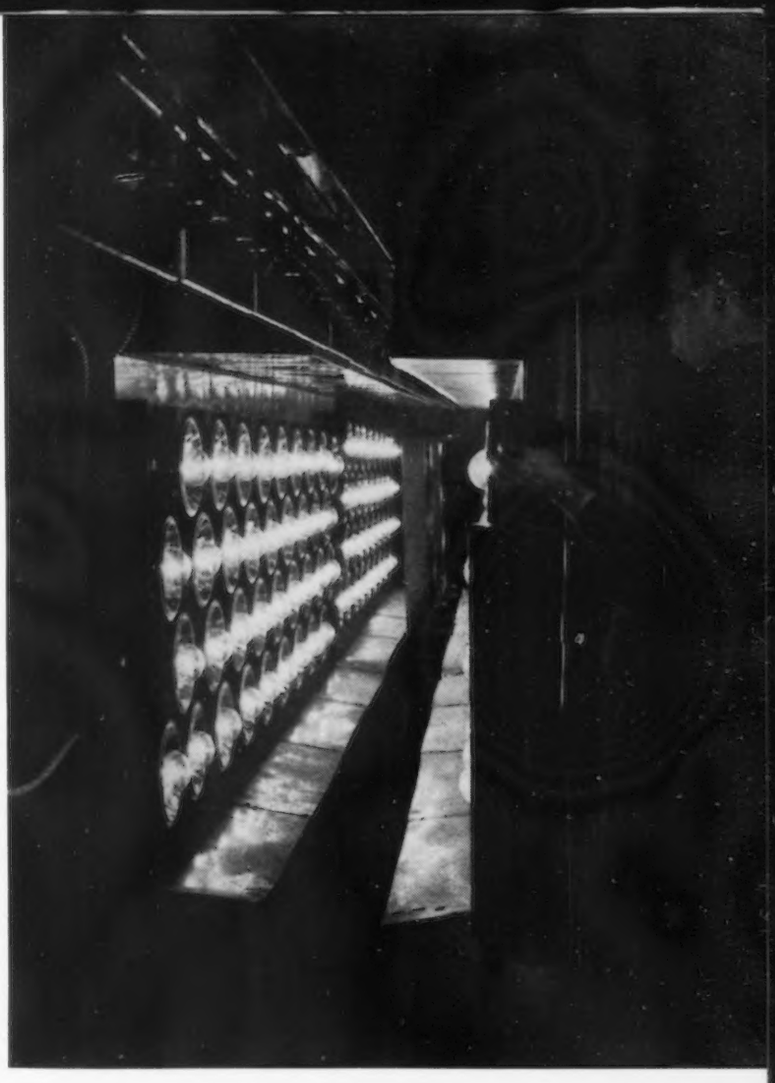
Tunnels of drying lamp units are becoming quite common. They should be designed to accommodate the largest object that will be passed through and still provide a clearance of approximately 12 in. between the article and the ends of the reflectors. A tunnel cannot be designed to take too many different sizes, otherwise its efficiency will be materially reduced when used to dry small articles. In a plant in which many different sized parts must be dried, it is best either to mount the small ones on "trees" before they pass through the tunnel or else have other tunnels of smaller size. Some tunnels are constructed with movable sides so that the tunnel itself can be made larger or smaller. Still another method is to turn off a row or two of the units if the article is of such a size that those units do not contribue appreciably. A tunnel can be of any cross-section, although it is generally best to have it conform to the shape of the article being heated.

Radiant ovens can easily be designed to be moved to the work. Such portable ovens present interesting possibilities. They can be used when the work is immovable or when it is too large to move easily. Banks of from 5 to 20 drying lamps and reflectors are now being used in many garages for touch-up work on cars. Using this quick-dry method makes it possible for the garage to use a baking enamel similar to that originally applied to the car rather than a less durable air-dry paint.

° ° °

SYNTHETIC enamel is baked in five minutes in this tunnel at the Steel Storage File Co., Cleveland.

° ° °



The design of a radiant energy oven should be preceded by experimental work. Paints generally cure much faster with drying lamps than in conventional type ovens but all finishes do not react favorably. Weight of metal, drafts, reflection factor of the work, etc., all influence the results. It is therefore desirable to construct a small section of the proposed tunnel or bank, large enough to completely cover the article being treated. Knowing, then, the time required to obtain the desired results, and the rate of production, the size of the final unit can be calculated. The energy cost can then be determined and compared with that of the conventional method. In most infra-red ovens both the initial cost and the operating cost are comparable or less than those obtaining with conventional methods.

The engineers at the Steel Storage File Co. conducted over 500 tests with different types of finishes before deciding on the final design for their drying lamp oven. This work was done in an experimental drying lamp oven consisting of 16 250-watt lamps and reflectors. These were mounted in two vertical banks facing each other and over a canvas conveyor belt with variable speed control.

Having decided on the paint to use, a drying lamp tunnel was then designed. It consists of 144 250-watt tungsten filament drying lamps in 9-in. diameter gold-plated reflectors. The lamps are mounted in two banks facing each other. The file cabinets are hung on a conveyor above and between the two banks. One bank of lamps is movable and the lamps at the bottom of both banks can be separately switched off, which permits the drying of a wide range of cabinet sizes. An ingenious switching arrangement turns on the lamps only opposite cabinets that are going through, thus contributing to a saving in operating costs.

The Steel Storage File Co. reports that the temperature attained by the metal going through this oven is 280 deg. F. and that a maximum of 2000 lb. of steel per hr. can be handled by it with 112 lamps operating. Since a temperature rise of 220 deg. is required, 48,400 B.t.u.'s per hr. have therefore been supplied to the metal. This corresponds to 14.2 kw. Since the oven consumes 28 kw. this means that their efficiency is 50 per cent.

TEMPER CRACKS IN HIGH SPEED STEELS

HIGH speed steels are generally used after being quenched from about 1300 deg. and tempered at 500 to 600 deg. C. By this tempering, hardness increases distinctly, there being a so-called secondary hardening effect. Often, there results a typical surface cracking.

Kaizo Monma, in the latest reports of Tôhoku Imperial University, tells of quenching and tempering high speed steels, using specimens with the following compositions: 0.56 per cent C, 19.7 W, 4.6 Cr, 7.1 Co, 1.27 V, and balance Fe. The specimens were quenched from 1300 deg. C. in oil, tempered for 30 min. at various temperatures up to 900 deg. C., using an oil bath or a vacuum furnace. Rockwell hardness then was measured at room temperature.

On tempering, the hardness decreases from 100 deg. to a minimum point of 350 deg. C., then it increases until the temperature rises to 550 deg. C., at which point a maximum hardness distinctly higher than the as-quenched state is obtained. For still higher tempering temperatures, the hardness decreases gradually at first and then very rapidly. Experiments were conducted in which the surface of the specimens to be used for hardness measurement were ground off to a depth of about 1 to 2 mm. before tempering, in order to remove the decarburized zone. On tempering these specimens, there occured no changes in the appearance, when the tempering temperature was lower than about 500 deg., but in the higher temperature range, that is 550 deg. to 650 deg., cracks appeared. Moreover, these cracks occurred only on the untreated surfaces and not on the previously ground surfaces. When the specimens were tempered at a higher temperature, no further cracking was observed. For convenience of description these cracks were designated as "temper cracks," and experiments were conducted to establish the cause of such cracking.

From the facts just mentioned, it may be assumed that the retained austenite contained in the quenched high speed steel changes to martensite by tempering, and hence this transformation might be the cause of temper crack; but, in the experiment, since heating and cooling during tempering were done very slowly, the mechanism of the crack should be quite different from that of carbon steel quenched in water. At any rate, the thermal stress which has been induced during the quenching operation, also might be taken as one of the causes of this crack, and if it were so, cracks should not occur when the specimen is quenched in a high temperature bath and is tempered simultaneously in the same bath.

The actual results were, however, opposite to this supposition. Thus, specimens 10x10x50 mm. in size were quenched from 1300 deg. in a molten metal bath of various temperatures, held in it for 5 min., and then cooled in air. When the temperature of the bath was low, no cracks occurred at all, but in cases where the bath temperature was moderately high, cracks appeared on the specimens. This result shows that cracks are not induced by higher cooling rates, but are formed by lower rates, and hence contrary to the common opinions regarding quenching cracks. Moreover, the specimens which were free from cracks in the quenching operation described can also be given cracks by a following tempering in the range of 550 deg. to 650 deg. Therefore, there appears to be no intimate relation between the crack in question and the thermal stress due to quenching.

By quenching in a high temperature bath, the rate of cooling is slow, and so, the Ar″ transformation, that is the austenite→martensite change, proceeds much more slowly as compared with the case of oil quenching. Then why does the crack occur in such a case? It is believed that the specimen has been forged and exposed to a very high quenching temperature, and therefore the outer layer of the specimen should be decarburized to a certain degree, and during quenching this decarburized zone will not show a marked expansion due to the Ar″ transformation, that is martensitization. Therefore, if such a decarburized specimen is quenched, severe tension should be induced in the outer layer owing to the Ar″ expansion of the inner portion.

When the temperature of the quenching bath is low, the cooling

velocity being rapid, much austinite will be retained in the quenched steel; therefore, the volume change of the inner portion will be small and accordingly the tensional stress in the outer layer small. However, when the temperature of the quenching bath is moderately high, the martensitization of the inner portion is evidently large and will cause the crack. Moreover, on tempering a quenched specimen, the retained austenite in the core will change to martensite, and so, the crack is induced in a similar manner. Therefore, the previous statement that no cracks appear on tempering a quenched specimen the decarburized surface of which had been previously ground off, should be self-evident.

In order to check this observation, dilatometric studies were made, using the high speed steel already mentioned, as well as a specimen of similar composition, but free from carbon. The specimen of carbon-free steel had a composition of 20 per cent W, 5 Cr, 7 Co, and the balance Fe. It was melted in a high frequency induction furnace, and then forged into a rod. The high speed steel and the carbon-free steel thus made were machined to 7 mm. in diameter and 50 mm. in length; they were heated to 1300 deg. C. and quenched in an oil bath. Then, the quenched specimens were subjected to dilatometric observations during repeated heating and cooling in vacuum, the temperature being raised gradually at each heating.

Curves (A) in the accompanying illustration are the results of tempering the quenched high speed steel. As seen in the curves, when the quenched specimen is heated to 500 deg., no abrupt change is observed in the heating curve; by holding 2 hr. at the same temperature, only a slight expansion appears; during the cooling no abrupt change is observable. In the second heating of the same specimen, where the maximum temperature is raised to 550 deg., the course of the curve almost coincides with that of the previous cooling curve, and by holding 2 hr. at the maximum temperature a slight expansion is again observable, and during the cooling the curve lies a little higher than that of heating, but shows no abrupt change until the temperature lowers to 300 deg., below which temperature it begins for the first time to show an abrupt expansion of volume. This indicates that the martensitization of the retained austenite in the quenched specimen is going on. In the third heating of the specimen to 680 deg., no abrupt change appears and the heating and cooling curves almost coincide. The fact that the martensitization of the retained austenite occurs during cooling of the specimen after tempering treatment at about 550 deg., is very significant.

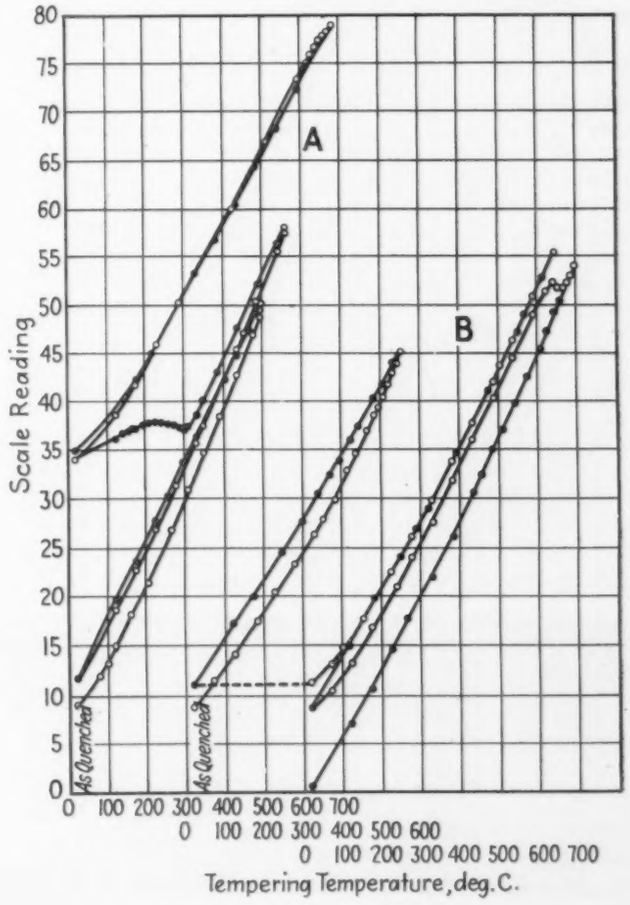
The results for the quenched carbon free specimen are shown in curves (B) in the accompanying illustration. By heating this specimen up to 550 deg., and by cooling again to room temperature, no abrupt change is seen. The successive heating to 650 deg. causes also no abrupt change, and the heating and cooling curves are exactly reversible. In the third heating to 700 deg., no abrupt change takes place up to 630 deg., but in the range of 630 deg. to 670 deg., a distinct shrinkage of volume is observed.

The hardness change of the quenched carbon-free specimen by tempering also was measured. The specimen quenched from 1300 deg. C. was tempered at a temperature for 30 min. in a vacuum furnace, and after cooling to room temperature the hardness measurement was made; the same specimen was heated to the next tempering temperature and treated in the same way, and so forth. As shown in curve C, in the range of temperature below 600 deg. C. the hardness increases only slightly with the rise of tempering temperature, and in the range 600 deg. to 700 deg. C. the increase is very abrupt, but with higher tempering it decreases quite rapidly.

Comparing these results for the two kinds of steels, the hardness-tempering temperature curves are pretty similar, but the course of the hardness curves is not quite the same with each. As obvious from the dilatometric curves, the secondary hardening of the high speed steel is in certain relation with the transformation of the retained austenite (age-hardening + martensitization), while that of the carbon-free specimen is simply of the age-hardening type.

From these experiments it may be noted that the quenched high speed steel does not change its volume with tempering at lower than 500 deg. C., but when the tempering is raised to 550 deg. or higher an abrupt expansion of the volume takes place in the course of cooling, and this expanded specimen shows no abrupt change by successive tempering up to 700 deg. Although the quenched carbon-free steel shows no abrupt change by tempering up to 600 deg., a slight shrinkage of the volume appears when tempered at 650 deg. or higher. Therefore,

(CONCLUDED ON PAGE 110)



DILATOMETRIC change of volume during tempering of quenched high speed steel (A) and no-carbon specimen (B).

THIS WEEK ON THE ASSEMBLY LINE

By W. F. SHERMAN
Detroit Editor

. . . Overhead cams and valves will make Ford Six an outstanding automobile engine . . . Super-performance indicated as main reason for design features that will disregard Ford precedents . . . Interrupted current and pressure on electrodes is incorporated in welding machine design . . . Two-speed hoist simplified in forthcoming model . . . Auto production remains steady at 103,370 units with March sales climbing sensationally.

DETROIT—Scavenging is one of the most important words behind the most important automotive development which will be heralded in the 1941 model season. It all has to do with the overhead valves which will be an important feature of the six-cylinder Ford engine for which production facilities are now being prepared.

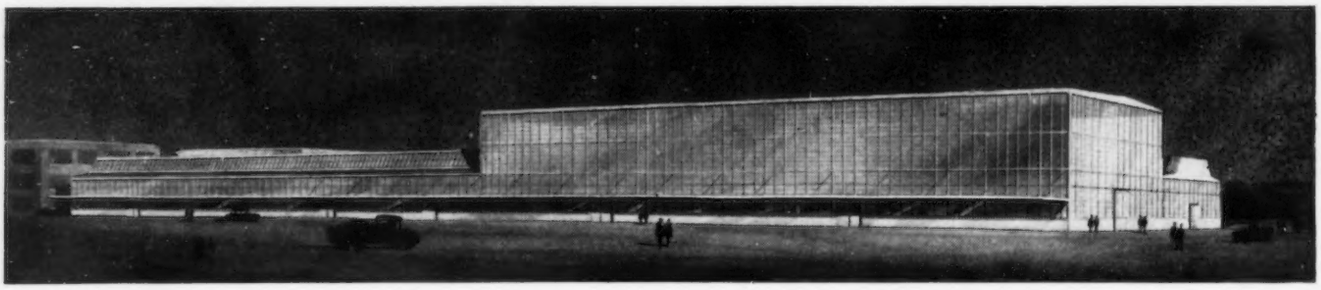
The "six" which has set automotive engineers talking, will not only be a radical departure in number of cylinders from the Ford V-8 arrangement, but will be noteworthy because it will represent Ford's first venture in the valve-in-head type of engine and will have an overhead camshaft heretofore seen only on ultra-special engines used for racing or aircraft. It will be an engine with 163 cu. in. displacement—very close to the Studebaker Champion displacement of 164.3—and for comparative purposes, much smaller than the Chevrolet, which has 216.5 cu. in. displacement. Intended to develop 70 hp., it is reported to be developing 80-88 in the sample engines now being test run. Torque which performance-wise is a more important criterion than is horsepower, is reported to be about 145 lb.-ft. Again for comparative purposes, the Studebaker Champion has 78 hp. and 128 lb.-ft. maximum torque. The high torque and horsepower of the Ford Six — in the contemplated 110-in. wheelbase chassis with lightweight body and integral frame — should give truly amazing performance if the production engines come up to the mark set for them by the experimental engines.

Part of the explanation for the better engine performance is in the scavenging of the combustion chamber which is improved by the use of overhead valves. To put it simply, it means that the burned exhaust gases are more completely and more quickly removed from the combustion chamber because the overhead valve port provides the most advantageous exit for the hot gases. At the same time, the colder, more dense and heavy charge of fuel for the next explosion can "drop" into the combustion chamber in larger volume and more quickly. The result is a greater "charge," not diluted by exhaust gases, so engine performance is more efficient.

Importance of the scavenging problem and the attainment of greater volumetric efficiency are constantly emphasized by automotive engineers, although the layman would think that the separate exhaust stroke of the piston in the four-cycle engine would sufficiently clear the combustion chamber. It is not generally known, except to gasoline engine designers, that conventionally both exhaust and intake valves are open simultaneously for a fraction of a second overlap. The designers are simply taking advantage of the weight of the incoming charge of fuel to displace an extra, final quantity of the hot exhaust gases.

Another advantage which accrues from the use of overhead valves is the opportunity for better design of the

ADDITIONAL manufacturing space at the Chrysler Highland Park plant will be available in June with the completion of a new building for which ground was broken March 29, according to Herman L. Weckler, vice-president in charge of operations. The building will replace two former structures. It will be one-story monitor type, steel construction with continuous steel sash and brick curtain walls. It will be 135 ft. x 575 ft. with a high press bay 75 x 268 ft. Almost all interior columns have been eliminated and only one row of columns 38 ft. apart is used in the building. Roof trusses will be 75 ft. and 60 ft. respectively. All glass on the south side of the building will be a special glare-free, heat resistant type.—Albert Kahn, Inc., architects.



ACCURACY . . .

harvests the daily hay

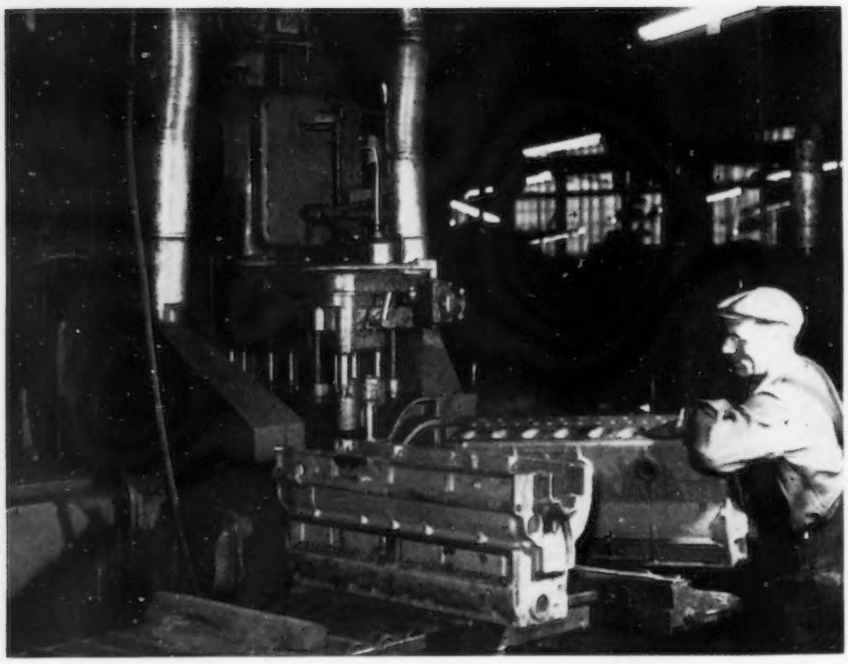


YEARS ago, the straightedge . . . yesterday, the safety razor . . . today, the mass-produced dry shaver—a miniature mowing machine well within the shaving budget of millions of men who choose to use it. Accuracy makes it possible. Again and again, production accuracy at high speeds permits new, better products—increases the world's wealth by cutting the world's expenses.

Accuracy is the golden rule at Pratt & Whitney . . . the inflexible regulation laid down by the founders eighty years ago. Through the years skilled men—in many cases several generations within the same family—have wholeheartedly accepted this rule; today there are over 2600 Pratt & Whitney craftsmen whose entire activity centers around accuracy alone. Their creations—Pratt & Whitney machine tools, cutting tools, and gages—transmit this accuracy in turn to the products they make. When you buy, investigate Pratt & Whitney equipment. It pays big dividends.

PRATT & WHITNEY

Division **Niles-Bement-Pond Company · Hartford, Connecticut, U. S. A.**



THE dust collector system in the cylinder block department of Pontiac Motor plant removes 110 lb. of metal dust and chips from the air each hour, serving 22 machines. It is a high velocity system with a 2-in. suction head at the hood over the cylinder block with an air velocity of 4,000 ft. per min. in the branch pipe leading from the hood. The dust is carried to a fully automatic Pangborn dust collector on the roof, is shaken out and removed from the air, and falls onto an endless belt which carries it to the end of the building where it is dumped into a hopper. Filtered air is returned to the motor room.

THE BULL OF THE WOODS — BY J. R. WILLIAMS



combustion chamber to extract more power from the gasoline with less "knock"; thus a greater opportunity to take advantage of high test or ethyl fuels. Incidental to this is the fact that the intake valve and adjacent area serve effectively as a "quench area" with advantages in the direction of greater power and less knocking.

Some Problems Exist

The overhead camshaft is described by engineers as a "sweet" design, but one involving some difficult structural and design problems. Of course, it reduces the amount of mechanism involved in the valve train that is used in the Chevrolet and Buick type engines and there are no long push rods, overhead rocker arms, or similar devices, which in the past have received a lot of blame for valve clatter. The more direct mechanism of the overhead camshaft eliminates some lost motion and possibly improves the accuracy of the timing of valve opening and closing. Two major problems exist: one is the necessity for a long gear train, very long chain drive or a vertical shaft driven by bevel or spiral bevel gears; the other is the elimination of oil leakage down the tappets and valve stems into the combustion chamber. For the first problem it is not likely that the solution will be a chain and sprocket drive because even a short chain operating on close center distances would have 400-500 separate parts, it is estimated. So far, Ford's choice of method for driving the overhead camshaft has not been revealed. The problem of oil leakage has usually been solved by the use of packing or hydraulic schemes.

The tool and die season is far enough advanced, and the time for specifying machine tools and other equipment for next year's models has so nearly expired, that it is safe now to say that neither Chevrolet nor Plymouth in 1941 will compete in the lower priced field which Ford indicates it will explore along with Studebaker, Nash and Willys. It can also be said now that Packard has apparently decided again not to go ahead with production of its light six car which at least twice has looked as though it might be produced. Apparently those who have decided to stand pat on present designs are satisfied with current success, and their position is understandable.

On the other hand, the 60-hp. Ford has steadily lost ground to its V-85 "big sister." The general explanation of the decline in popularity of the V-60 is that there is not enough differ-

ence in appearance, fittings or price between the 60 and 85-hp. Fords to attract customers. In addition, the basic Ford chassis with only 60-hp. suffered when performance was compared with the plentiful acceleration, speed and economy that is built into the V-85 at such a small differential in price. In the first three months of production, less than 7 per cent of the scheduled production of Ford passenger car engines was in the 60-hp. class. The total for the model year is not likely to exceed 25,000 or 30,000 units, so the car has probably been more costly to produce than is warranted by its volume. Tooling for the new six-cylinder car is on the basis of 75 per hr., 1200 cars in a two-shift day, or 24,000 a month. Some Ford men are so optimistic about the new car that they freely predict that eventually these numbers will be doubled.

It is expected that the V-60 job will be scrapped altogether. It is understood that much machinery formerly used on the 60 line has been rebuilt to produce the six.

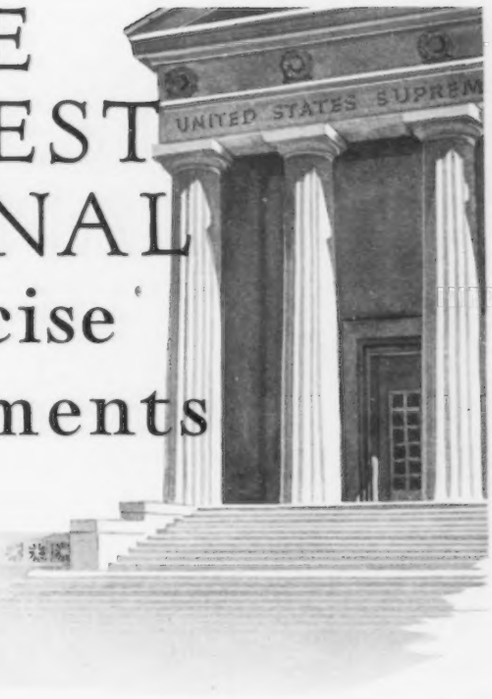
Welding Developments

Welding developments in Detroit are usually concerned primarily with automotive gages of steel. However, one of the latest developments is concerned with the welding of inch-thick forged or rolled sections with a resistance welding machine that uses an interrupted current, plus interrupted pressure on the electrodes. The interrupted pressure is superimposed on an initial pressure, thereby eliminating hammer-blow effects. The process, soon to be revealed, is impressive as something approaching the original welding art wherein metals were heated and hammered together on a forge.

A two-speed hoist with a single-speed electric motor is another development which is still "under wraps" here. For many purposes hoists must operate at a very slow speed in the zone closest to the ground but are required to operate at faster speeds after the critical zone is cleared. Such requirements exist, for instance, in handling molds, placing dies, dropping bodies, frames or minor sub-assemblies to assembly lines and in similar operations. The new design, without special controls of any kind, is relatively simple and involves only the use of two diameters of drums integral on a shaft. Both drums wind the cable simultaneously but one, being larger than the other, helps to create a creeping effect which results in a high-speed lift or drop. When the critical (slow speed) zone is reached, the cable on the smaller drum in all paid out

(CONCLUDED ON PAGE 110)

THE HIGHEST TRIBUNAL in precise measurements







THE Sheffield Visual Gage is a supreme court of accuracy in the inspection department, and its decisions don't need interpretation.

The Visual Gage is simple to set up, easy to operate, and in service is the most rapid precision gage available. Accurate readings are flashed on the scale instantly when the work part is passed under the gaging point.

There is nothing in the mechanical assembly of this gage to wear out of adjustment. The device used for magnification (the Reed Mechanism) is mechanically positive and frictionless. It needs no periodical adjustment, and is foolproof.

In addition, the Sheffield Gage has greater capacity and greater flexibility than other precision gages, although these advantages do not carry with them the penalty of higher costs.

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NITRIGAGES

THIS WEEK IN WASHINGTON

. . . Senate Committee upholds sales of latest U. S. planes abroad . . . NLRB recognizes property rights in packing house case . . . Inquiry into identical bids to continue . . . 400 more agents to enforce Fair Labor Standards Act.

o o o

By L. W. MOFFETT
The Iron Age

o o o

WASHINGTON — The Administration's policy of releasing aircraft for foreign sales was upheld as being in the public interest last week by the Senate Military Affairs Committee when it turned thumbs down on a resolution to investigate the subject. The resolution was proposed by Senator Robert M. La Follette, Progressive of Wisconsin.

The resolution was aimed at determining whether the national defense program was being delayed through foreign purchases of arms and aircraft, whether bomb sights and other devices classified as military secrets have been released for foreign sale, and whether the export policy will mean higher prices to the Army and Navy in their armament programs. On all three subjects the committee reported that there was nothing to investigate.

This decision was made after hearing testimony from Secretary of War Woodring. Assistant Secretary Johnson and Gen. George C. Marshall. These witnesses, who earlier in the week had testified before the House Military Affairs Committee on the same controversy, assured both committees that expansion of the domestic aircraft industry as a result of large foreign orders was in the cards and that the foreign sales would be highly advantageous to this country's defenses. They also denied the allegations that vital secrets of American defenses were being released for sale abroad.

The House Military Affairs Committee likewise decided to drop a contemplated investigation.

Lessens Defense Needs

Advocates of curtailing defense expenditures in Congress were quick to seize upon the committees' approval of the Administration's policy of releasing the most advanced type of American aircraft to European countries. Their argument was that to give European belligerents the right-of-way in aircraft purchases is proof that there is no longer any necessity for immediately building up this country's air defenses.

Economy adherents, led by Senator Bennett Champ Clark, Democrat of Missouri, and others who have been out of sympathy with the Administration's defense program, laid plans to demand appropriation reductions to cover only the number of planes which experts estimate would be delivered to the Army and Navy by July 1, 1941.

By that date, the Army Air Corps is scheduled to have 5500 planes under the Army's original $300,000,000 program but the possibility now is that this number may be reduced to 3500 on the ground that foreign sales would obviate the immediate requirement for building up a reserve. General Marshall confirmed reports that such a development may be in the offing, estimating that a possible saving of $27,000,000 thereby might be effected next fiscal year.

Plane Sales Rise

While the foreign aircraft controversy was quieting down, the Commerce Department's latest figures on aeronautical exports showed that February sales aggregated $20,559,703, a 204 per cent increase over February exports last year, but 27 and 19 per cent respectively below the record totals for December and January.

The ten countries purchasing $19,398,947 worth of aircraft, engines and parts—constituting 94 per cent of the total—included, in the order of their purchases, France, Australia, United Kingdom, Finland, Canada, China, Sweden, Netherlands, Indies, Turkey and Norway. Aircraft exports going to the first five countries during February were valued at $8,121,029 for France; $3,520,758 for Australia; $2,529,754 for United Kingdom; $1,748,299 for Finland and $1,311,991 for Canada.

400 More Agents to Enforce Fair Labor Standards Act

WASHINGTON — Colonel Philip B. Fleming, administrator of the Fair Labor Standards Act, last week took steps to crack down on alleged violators of the law by announcing that more than 400 inspectors—important cogs in the division's enforcement machinery—will be in the field by April 16. More will be added until the total stands at 700.

The administrator made known his plans to expand the wage-hour enforcement arm as the House debated plans to cut the division's appropriations for the next fiscal year. Opponents of the law pointed to the announcement to substantiate their predictions, made while the wage-hour bill was pending in Congress, that a horde of government inspectors would inevitably be set up to harass industry and pry into private business.

Out of 441 inspectors to be assigned before mid-April, 37 will go to Region 1, covering New England 53 to Region 2, New York and Connecticut; 37 to Region 3, Pennsylvania; 26 to Region 4, New Jersey and Delaware; 45 to Region 10, Ohio and Michigan, and 42 to Region 11, Illinois, Indiana and Wisconsin, and 31 to Region 5, Virginia, West Virginia and Maryland.

Representative Matthew A. Dunn, Democrat of Pittsburgh, charged in the House that efforts to reduce the division's appropriations was the result of "unscrupulous business men" who know, he said, that it would be "a difficult task to have this law repealed,



HOW THEY GOT A LILY OUT OF BED IN TIME FOR EASTER



1 IF EASTER LILIES BLOOM TOO LATE, florists lose heavily. To the rescue come scientists, who show how blooming can be advanced two weeks with electric light. At Ohio State University, lily at left was kept at 60° F with no added light. Lily at right was given same heat plus four hours extra light daily.



2 SCIENTISTS USED standard 150 watt G-E MAZDA lamps in this test. Similar experiments have employed sodium vapor and mercury arc lamps. General Electric research is constantly finding new ways to improve existing lamps, as well as developing new lamps to meet specific problems.



3 WHAT CAN LIGHT DO FOR YOU? Chicago's Belmont Radio Corporation (above) reported an increase in production and a corresponding decrease in rejects after light-conditioning. Perhaps better lighting can improve your business. Ask your G-E lamp man or your local electric service company.



4 THIS GIANT "ELECTRIC EYE" measures light output of G-E bulbs... one of 480 tests and inspections. Sixty years of G-E research and development have increased lamp efficiency as much as 1000%, reduced prices as much as 85%. Today's 100 watt 15c lamp is almost 50% brighter than the same size you paid $1.10 for in 1921. To get more and more light for your money, year after year, be sure to buy G-E MAZDA lamps.

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Year by year, better lamps for every purpose

G. E. MAKES 9000 DIFFERENT LAMPS...

How many can help your business?



LIGHT WHERE YOU NEED IT with G-E MAZDA Projector lamp. Lens, filament and reflector in one all-glass unit. The 150 watt size is now only $1.40.



INCREASED DEMAND for more light has sold more larger size bulbs, like this 300 watt inside frost G-E MAZDA lamp. It sells for only 55c.



THIS LOCOMOTIVE HEADLIGHT lamp (250 watts), has dual filament support, stranded lead-in wires to resist vibration. It has a list price of $1.40.



INDIRECT LIGHT at low cost with G-E Silvered Bowl MAZDA lamps. A coating of mirror silver is sealed on bowl. The 150 watt size costs only 55c.

so they resort to underhanded methods by having their friends in Congress cut the appropriations."

From the Republican side came the allegation that the wage-hour law was passed by Congress "not because of the will of Congress but because it came from the White House." This charge was made by Representative William P. Lambertson, Republican of Kansas, who told the House that small businesses are being destroyed by the wage-hour law.

Forecasting that the Fair Labor Standards Act will follow in the footsteps of the NRA, and be ruled out as unconstitutional, the Congressman declared that if wage-hour officials confined themselves to the problems of subnormal conditions in interstate business, and stayed within the original purposes of the law, they would not need so much money.

"But they are trying to run the world, they are trying to run everybody's business," he complained, adding:

"I never was more satisfied with any fight than the one I made against the passage of this act. It stands next to the Labor Relations Act in the hamstringing of business in America. If I had my way I would wipe it out and let business have a chance again. I would at least limit it to the correction of subnormal conditions such as it was intended to correct."

New Deal Agency to Continue Inquiry Into Identical Bids

WASHINGTON—Development of plans to relieve the Government questionnaire burden on business, an investigation into Government buying practices, and a compilation of additional figures on identical bids is a large order for an agency whose enabling act is scheduled to terminate in July. Yet that briefly is the job assigned to the Central Statistical Board, the agency established in the early days of the New Deal to coordinate all Government statistics.

While the board actually will be abolished in July, the catch is that its organization will linger on. This agency, to be renamed the Division of Statistical Standards, has learned that adequate authority for its functions is contained in the Budget and Accounting Act of 1921. So, with an allocation of $126,000 from Budget Bureau funds, an amount already approved by Congress, the agency can continue the White House-assigned job of simplifying questionnaires and curtailing unnecessary duplication of Governmental statistical effort.

In addition, the agency will probe phases of Government buying practices as carried out by the Treasury's Procurement Division, central government purchasing agency, which has been under scrutiny recently by both the Treasury Department and the Budget Bureau.

The collection of additional figures on identical bidding—another assignment—is in line with a report released by the Procurement Division early this year (see THE IRON AGE, Jan. 11, 1940, p. 49), in which it was reported that out of $860,044,970 expended by the Government during the 12-month period ended November, 1938, about 10 per cent represented purchases on which identical bids had been received. At that time it was announced that a study of the subject would be continued.

While the board will become a mere division of the Budget Bureau, now a part of the White House executive offices, presumably it will be able to carry out its former objectives more effectively than it did when it had the status of an independent administrative agency.

To what extent the division will be able to make effective its recommendations for lightening the questionnaire burden on industry is problematical but the subject is being explored. A bill to carry out recommendations which the agency sent to the White House in January, 1939, was introduced in Congress but progress on the measure came to an abrupt stop when the President's reorganization plans were announced.

Briefly, the recommendations called for: (1) Further consideration to be given a possible consolidation of tax returns; (2) confidential information to be made available to other agencies of the Government under rules affording "proper protection"; (3) hearings and a report to the President in cases where the board was unsuccessful in eliminating duplication. The President could order the duplication corrected; (4) the collection of figures by only one agency where it was found that the requirements of more than one agency seeking the information could be served adequately. The President could make such an order effective under the proposal; (5) a system requiring Government bureaus collecting statistics to keep uniform records of all questionnaires and report regularly to the central statistical agency.

Trade-o-graphs to Show Monthly Trade Trends

WASHINGTON — Designed to show monthly trends in foreign and domestic trade developments, a new series of illustrated "Trade-o-graphs" is being inaugurated by the Commerce Department's Bureau of Foreign and Domestic Commerce.

The plan calls for issuance of four pictographs during any given month to designate domestic business conditions, five on exports, and three covering imports. To be illustrated in the domestic series will be the value of manufacturers' inventories on a monthly basis, value of new orders, and the monthly flow of national income to individuals in the United States.

The export series will portray in dollar value monthly shipments abroad of iron and steel mill products, industrial chemicals, aircraft and parts, cotton and wheat. Director James W. Young, who announced the new series, said that all the illustrated charts will give current data, with comparisons for the previous month and the corresponding month a year ago.

India's Manganese Exports Gain Sharply

WASHINGTON—Official figures just issued show that exports of manganese ore from British India during January of this year, totaling 80,327 long tons, were approximately one-third larger than the totals of the two preceding months, according to Vice Consul Harrison Lewis, Calcutta.

The gain was accounted for by the increased shipments to the United Kingdom, Belgium, France, and the United States, which more than offset the decline in exports to Japan and other countries. The most notable increase was in exports to Belgium, which rose from a negligible figure to 14,500 tons in January. January exports to the United Kingdom and the United States, amounting to 23,930 tons and 18,100 tons, respectively, represented in each case an advance over the preceding month of approximately 50 per cent.

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JOHN A. DILLON, President

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NEW YORK, N.Y.

April 4, 1940

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The sales possibilities of your products is largely determined by the ability of your sales organization to secure orders.

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Standard International Sales Corporation has been formed to sell in the Eastern section of the United States and foreign countries, products of representative manufacturers who produce materials used by - Railroads, Shipbuilders, Oil Companies, Freight, Passenger Car and Locomotive Builders.

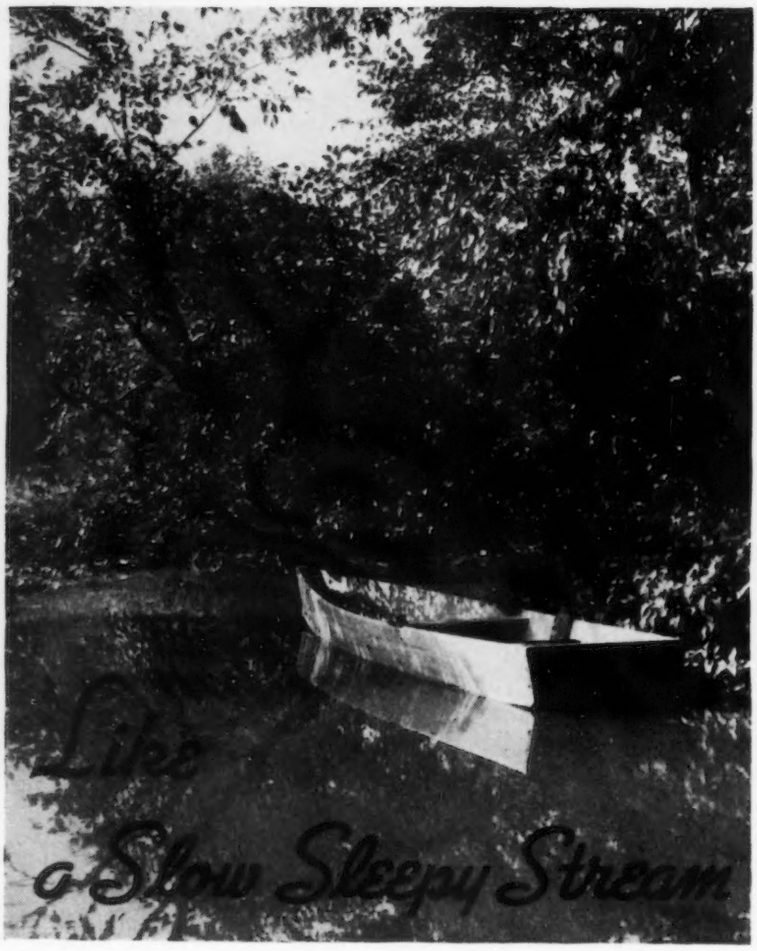
Our efficient organization is at the disposal of a limited number of high-grade companies who wish to avail themselves of the service we have to offer on a basis that is fair and equitable.

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By Dillon

President.



In any plant using obsolete equipment production will flow much like this stream —sluggish and slow. No manufacturer can afford to let production bog down on this account. For today's competition is so keen that to lead the field or stay up with the leaders necessitates the use of all available cost reducing equipment. ◇ There are even many instances where the age of equipment in use is not an accurate measure of its efficiency. That is what ball bearing manufacturers are learning today as they are becoming aware of the production possibilities of the new Landis No. 1 RACE-A-WAY Grinder. They are finding that older equipment, although purchased not so long ago and mechanically in excellent condition, has been made costly to operate in view of the 25 to 30% greater production possible on the new Landis. ◇ Any manufacturer whose plant is equipped with modern Landis Grinders need never worry about stagnant production in his grinding departments. No. 327



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Maritime Commission, Ahead of Goal, Plans 15 Ships for 1940

WASHINGTON—The shipbuilding program of the United States Maritime Commission, already about one year ahead of its 50-ships-a-year goal, will include only about 15 ships, estimated to require about 87,420 tons of steel, during 1940.

Information furnished THE IRON AGE indicates that the following contracts will be awarded under some phase of the commission's program during 1940:

No. ships	Type	Bids due	Steel Tonnage Each	Steel Tonnage Total
3	Mississippi shipping	April 9	4,140	12,420
2	Trans - Pacific luxury liners	May 7	13,800	27,600
6	Tankers	March 19	5,140	30,840
4	Export boats	After May 15	4,140	16,560

Bids have been asked on all the above ships except for the four export boats on which bids are expected to be invited for opening on or about May 15. Any construction over and above the 15 ships will likely be for tankers although this is not known definitely. The commission's interest in the construction of tankers is limited to the Federal subsidy given for the incorporation of certain national defense features. Otherwise the contract is placed directly by private operators with the shipbuilders.

For the current fiscal year the Maritime Commission received about $100,000,000 in cash, $235,000,000 in new contract authority. For the next fiscal year beginning July 1, the Commission will be given $144,500,000. That is the figure authorized by Congress in the independent offices appropriation bill and represents a compromise on the part of Congressional members who were showing signs of effecting economies at the time the bill was approved.

The House started out by cutting $75,000,000 from the budget estimate for the Maritime Commission. The Senate restored $39,000,000 of that cut but when the measure went to conference, the Senate increase was cut in half. The result is that the Commission's program probably will not exceed the 15 ships this year.

However, the agency is still about a year ahead of its program because of the speed with which contracts were awarded late last year when an attempt was made to beat the gun on price increases which appeared to be in the offing at that time.

British Will Push Steel Exports to South America

WASHINGTON—Despite the absorption of total British steel production for war needs, the British Export Council is making plans to develop export trade, particularly to South America, when domestic production reaches a level to permit an export margin.

A report to the Commerce Department also indicated that present capacity of British steel mills is at the rate of 14,500,000 tons a year. The addition of Empire output is expected to increase this figure to 18,500,000 tons. The country continues to import large quantities of semi-manufactured steel, principally from Belgium, Luxemburg and the United States. Because of a deficiency of British mills able to produce ingots and raw steel, imports of such items are essential, the report said.

The British steel industry was represented in the report as having large pre-war contracts with the Dominions. Until these commitments are satisfied, it was said, there will be little British-produced steel available for export. The report also quoted authoritative information to the effect that when Great Britain is finally in a position to export steel it will be in the highly finished form.

Government Orders

WASHINGTON — Government contracts for iron and steel products, as reported by the Labor Department's Public Contracts Division for the week ended March 23, totaled $160,000. Contracts reported for the same period aggregated $531,423 for machinery; and $136,415 for electrical apparatus and supplies. Details follow:

Iron and Steel Products:

Blaw-Knox Co., Pittsburgh, TVA, wall quoin castings	$32,300
Transue & Williams Steel Forging Corp., Alliance, Ohio, War Ordnance, end connection	26,947
Clayton & Lambert Mfg. Co., Detroit, War Signal Corps, torch	Indefinite
National Forge & Ordnance Co., Irvine, Pa., Navy Office of Secy', gun barrel forging	62,250
Carnegie-Illinois Steel Corp., Pittsburgh, Panama Canal, corrugated roofing	39,668
C. O. Jelliff Mfg. Corp., Southport, Conn., Panama Canal, cloth, wire, copper	14,162

Machinery

Crosby Steam Gage & Valve Co., Boston, Navy Purch. Office, gages	$20,858
Gisholt Machine Co., Madison, Wis., Navy S&A, turret lathe	15,648
Worden Allen Co., Milwaukee, TVA, valves	26,952
James M. Motley & Co., Inc., New York City, War Ordnance, drop hammers	29,665
Buda Co., Harvey, Ill., and Spring	

2,500,000 POUNDS OF Carey BUILT-UP ROOFING COVER MODERN STEEL MILL



THIS Carey Roofing contract, calling for 1,175,000 lbs. of slag, 325,000 lbs. of Carey Felt and 1,000,000 lbs. of bitumen was carried out on schedule, *in winter*, to give long lasting, low cost per year protection to this giant, strip steel mill.

Let Carey solve your roofing problem with a roof that lasts longer—costs less per year—a roof engineered to your specific conditions.

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Dependable Products Since 1873
BRANCHES IN PRINCIPAL CITIES

City Foundry, Waukesha, Wis., Norfolk Navy Yard, cylinder heads	$18,135
Worthington Pump & Machinery Corp., Navy Yards & Docks, diesel engine generator and asseys	55,264
Von Hamm-Young Co., Ltd., Honolulu, Navy Yards & Docks, cold storage mchy.	94,074
Moline Elevator Co., Moline, Ill., Navy Yards & Docks, elevator modernization	12,406
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y., Navy Yards & Docks, bridge cranes	157,560
Murphy Elevator Co., Louisville, Navy Yards & Docks, elevators	46,444
General Elevator Co., Inc., Baltimore, Navy Yards & Docks, elevators	38,731
Euclid Crane & Hoist Co., Euclid, Navy Yards & Docks, bridge crane.	15,686

Electrical Apparatus and Supplies

Collyer Insulated Wire Co., Pawtucket, R. I., Navy S&A, electric cable	$42,140
National Electric Products Corp., Pittsburgh, Navy S&A, cable	10,815
General Electric Co., Schenectady, Navy S&A, cable	17,837
American Transformer Co., Newark, War Signal Corps, rectifier power equip.	45,840
American Steel & Wire Co. of N. J., Worcester, Mass., Navy S&A, electric cable	9,790
Okonite Co., Passaic, N. J., Navy S&A, cable	9,991

Control

AS EASY AS THIS



AN ADVANTAGE OF A-E-CO HELE-SHAW FLUID POWER

NEXT time you take a paddle in hand, notice how your canoe responds to a flick of your wrist—and remember—a Fluid Power driven machine responds even more easily to your requirements for speed and power.

At a touch of your fingers you can regulate the speed of a hydraulic mechanism over a wide range, choosing with hair-line precision the speed you want.

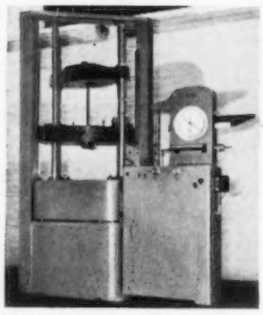
You can vary the pressure from a gentle nudge to a push of authority of 3000 pounds per square inch.

In addition to control, Hele-Shaw Fluid Power (oil under pressure for driving machines) has other advantages — mechanical simplicity, dependability and ease of operation.

You can locate a Hele-Shaw pump anywhere on or off the machine you drive, near it or remote from it. There is no lubrication problem because the Fluid Power system is self-lubricating.

Fluid Powered machines can be controlled manually or automatically for one or a complete cycle of operations.

Look into Hele-Shaw Fluid Power before you design, build or buy machinery. If we do not now have the answers to your questions, we'll gladly put our engineers to work on them.



TINIUS OLSEN TESTING MACHINE CO. drive their 300,000 lb. Hydraulic Universal Testing Machine with a Hele-Shaw Pump. Choose it for convenient and accurate control of speed, and power free from pulsations.



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Other A-E-CO Products: Lo-Hed Hoists, Taylor Stokers, Marine Deck Auxiliaries.

WASHINGTON—The Navy Department's Bureau of Supplies and Accounts last week awarded contracts to the following companies:

American Tool Works Co., Cincinnati, engine lathe, $12,677; Ingersoll-Rand Co., Washington, D. C., pumps, $275,561; Bright Star Battery Co., Clifton, N. J., dry batteries, $19,480; International Nickel Co., Inc., New York, nickel-copper alloy, $7,869; Monarch Machine Tool Co., Sidney, Ohio, precision lathes, $6,964; William Sellers & Co., Inc., Philadelphia, boring, drilling and milling machines, $64,895.

American Brass Co., Waterbury, Conn., copper-nickel alloy tubing, $20,123; International Nickel Co., Inc., New York, nickel-copper alloy, $5,322; Griscom-Russell Co., New York, tube elements for main motor air coolers, $7,062; Northern Pump Co., Minneapolis, motor-driven pumps, $19,264; Worthington Pump & Machinery Corp., Harrison, N. J., motor-driven pumps, $35,912; Perine Machinery & Supply Co., Inc., Seattle, Wash., horizontal, boring, milling and drilling machine, $15,804.

Vandyck Churchill Co., New York, milling machine, $6,575; Electric Products Co., Cleveland, battery charging equipment, $10,786; Buffalo Pumps, Inc., Buffalo, $229,630; Worthington Pump & Machinery Corp., Harrison, N. Y., $252,586; Harrisburg Steel Corp., Harrisburg, Pa., high pressure air system separators, $7,100; United Aircraft Corp., Pratt & Whitney Aircraft Division, East Hartford, Conn., aircraft engines, $696,881; Worthington Pump & Machinery Corp., Harrison, N. J., air compressors, $24,786.

Wallace Supplies Mfg. Co., Chicago, pipe bending machine, $8,900; Eclipse Aviation Division, Bendix Aviation Corp., Bendix, N. J., utility winches, $9,323; Crocker-Wheeler Electric Mfg. Co., Ampere, N. J., motor-generator equipment, $27,155; Revere Copper & Brass, Inc., Baltimore, copper tubing, $20,944; Carleton Machine Tool Co., Cincinnati, radial drill, $25,070; General Electric Co., Schenectady, for developing high efficiency fan, $5,000.

Brown & Sharpe Mfg. Co., Providence, R. I., milling machines, $51,616; Walworth Co., New York, pipe fittings, $9,786; Pittsburgh Steel Co., Pittsburgh, steel pipe and tubing, $9,610; Harrisburg, Pa., Steel Corp., steel forgings, $7,120; Crucible Steel Co. of America, New York, steel forgings, $43,100; Aluminum Co. of America, Pittsburgh, ingot aluminum alloy, $34,742.

Link-Belt Co., Philadelphia, chains, $35,579; Curtiss Wright Corp., Curtis Aeroplane Division, Buffalo, spare parts for airplanes, $88,265; and the B. F. Sturtevant Co., Boston, ventilating fans, $6,710.

General Malleable Gains

WAUKESHA, Wis. — General Malleable Corp., according to L. D. Harkrider, president and general manager, is showing about 10 per cent increase in business over a comparable period last year. Production this year is expected to equal that of 1939. A new continuous annealing furnace and sand slinger unit have recently been installed. The company employs about 600 persons.

Program Prepared for Annual Chamber of Commerce Meeting

WASHINGTON—The wide interest of business men in national affairs is revealed by the fact that more than 60 subjects pertaining to such questions are scheduled for consideration at the annual meeting of the Chamber of Commerce of the United States, April 29-May 2. The proposals will go before the resolutions committee before they are presented to delegates on the final day of the convention. Among the subjects to be dealt with are the following:

Administrative law; capital goods and capital markets; census of 1940; construction; federal fiscal policies, including budgeting, expenditures, strengthening of fiscal controls, financial methods, national debt and taxation; federal encroachment upon functions which are reserved to the states; foreign trade, including tariffs, reciprocal agreements and foreign trade zones; government competition; highway planning and highway transportation; interstate trade barriers; Labor Relations, Wage-Hour and Walsh-Healey acts; national defense; relief administration and relief activities; and social security.

Logan-Walter Bill Indorsed

Under administrative law are resolutions endorsing the Logan-Walter bill as a measure providing against continuation and extension of abuses now inherent in promiscuous issuance of rules and regulations by federal administrative agencies. Encouragement of private capital for extensive investment for plant equipment and new construction as a means of attaining high levels of employment and income is proposed by the Machinery and Allied Products Institute along with a number of other organizations. The MAPI proposes that Congress take immediately affirmative action to modify laws regulating issuance of securities and study "with the utmost care the effect upon capital markets of new legislation proposed for the regulation of investment trusts."

Many resolutions, reflecting concern over the national debt, now promising to exceed the $45,000,000,000 limit, take a crack at wild spending. The Federal Finance Committee recommends a declaration that Congress should assert its constitutional control over fiscal policies and take positive steps toward placing the financial affairs of the federal government on an orderly basis, and should have an agency of its own, composed of key members, to consider the budget as a whole and to propose to Congress the aggregate total of expenditures. This committee also proposes a declaration for strengthening fiscal controls in the federal government through authority in the President to designate activities which should be discontinued; through reduction in expenditures below appropriations if necessary to prevent a deficit; through disapproval of individual items in appropriations bills; through all spending agencies being brought under control of the bureau of the budget; through strengthening the allotment system

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under the bureau of the budget to prevent deficiencies; through the Comptroller General being more active in developing an improved and uniform system of accounting; and through the agents of all spending agencies being subjected to the Comptroller General's audit.

NLRB Revision Proposed

Broad revision of the National Labor Relations act is proposed in a number of declarations. The Illinois Manufacturers Association calls for amendment at this session of Congress, the preamble to be revised to indicate mutuality of interest between management and men and to encourage development of harmonious labor relations, and the law to be amended to require fair and impartial trial by the board and to give full power of review to the courts, with the provisions endorsing and encouraging the closed shop and establishing majority rule to be repealed, and the board and its agents to be prohibited from acting as mediators or conciliators.

The Rochester (N. Y.) Chamber of Commerce proposes a declaration of the urgent necessity for a revision of the Labor Relations act and of the Wage-Hour act. In connection with the Labor Relations act it proposes that the law should be made reciprocal in regard to unfair and illegal labor practices; that employers should have an express right to petition for certification of bargaining agencies; that the right of freedom of speech between employers and employees should not be encroached upon; that majority rule should be applied only to appropriate units, with preservation of the right of individual employees, or groups, to discuss with the employer at any time grievances or other matters; that there be required a lapse of a sufficient interval of time between a decision to strike and the starting of a strike; and that the labor board should be restricted to administrative matters, with its judicial function transferred to the courts or some other agency. The Sioux City (Iowa) Chamber of Commerce proposes a declaration that the Labor Relations act should be amended in accordance with the Smith bill, and that also labor organizations should be suable and responsible.

Other Proposals

To cut down public expenditures the Federal Finance Committee would have all business organizations refrain from requesting federal funds for local or specialized purposes and seek to persuade state and local authorities from requesting or accepting such funds.

Proposals by the MAPI in addition to those mentioned include the following:

Recognition of the contributions of inventions, scientific discoveries and new processes to national progress, and opposition to placing obstacles in the way of continued progress, as through ill-advised changes in patent laws; extension of Revenue act provision for carry-over of net operating loss for two years in order that inequities under present conditions may be eliminated; more adequate provision under Revenue act for depreciation and obsolescence; Treasury should continue to make clear provision of Section 102 of Revenue, imposing penalties on accumulation of corporation surpluses will be "meticulously" administered * * * "in order that there may not be aroused appre-



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hensions that will be deterrents to business enterprise and employment."

The New Orleans Board of Trade proposes that the Walsh-Healey act be repealed, and not extended. It also urged that the federal government "return to its long-established policy of competitive bidding in its purchase of manufactured goods."

Scrap Freight Rates Cut

WASHINGTON — Reduced carload rates effective June 26 on iron and steel scrap from North Carolina, South Carolina, Tennessee, Virginia and West Virginia to Ashland, Ky., and Portsmouth, Ohio, were prescribed in an Interstate Commerce Commission decision last week. The findings grew out of a complaint made by the Lynchburg (Va.) Chamber of Commerce in behalf of Abe Cohn, operating as the Lynchburg Iron & Metal Co.

Rates from southern territory in Virginia, North Carolina (except Asheville), South Carolina and Tennessee were held to be unreasonable for the future to the extent that they exceed 15 per cent of the interterritorial North-South scale (K-2 first-class rates) from the short-line distances to Ashland. The rates will be subject to the commodity rate increases authorized Oct. 19, 1937, or the general percentage increases authorized March 8, 1938, minimum 40,000-lb.

Rates from official territory in Virginia and West Virginia were found to be unreasonable to the extent that they exceed 70 per cent of the basic scale of rates on iron and steel products in official territory, minimum 44,800-lb. subject to the foregoing 1937 and 1938 increases. The decision pertaining to these rates also set up branch line arbitraries, ranging from 2.5c. per 100-lb. for 10 miles and under up to 7.5c. for 100 miles and over. Reparation on past shipments was awarded.

Rates from Asheville were held to be unreasonable to the extent that they exceeded $4 per gross ton prior to and $4.20 subsequent to the 1937-1938 increases. Reparation was awarded.

Passing upon the Hyman-Michaels Co. case, decided April 29, 1939, the commission modified its findings by increasing the minimum from 40,000-lb. to 50,000-lb. This case involved rates from Camden, Sumter and Wilson's Mill, S. C., to Ashland and Portsmouth.

Labor Board Recognizes Property Rights in Packing House Case

WASHINGTON — Between sweats over a slash by the House in its appropriations, the much jostled National Labor Relations Board last week sat up long enough to take official notice of the Supreme Court's ban on the sit-down strike. Cautious perhaps lest use of the term would offend the sensibilities of the sponsors of this technique to enforce labor demands, the board, passing upon CIO's Packing House Workers' Organizing Committee's complaint against Swift & Co., said that

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"refusal to leave the plant resulted in substantial damage to the company's property."

"Such conduct constituted activity prescribed by the Supreme Court in the Fansteel case," the board said.

While recognition of the court's outlawing of the sit-down strike was accepted as a force-fed dose, there was some surprise that the board, usually reflecting bland indifference to strike-caused damage, should have recognized such a thing as property rights. There was speculation whether attacks in Congress on the board and court decisions against organized labor played a part in the board's consideration of property damage. The board, however, rubbed the union's fur the right way for it by ordering that the company's struck plant at Sioux City, Iowa, recognize it and disestablish an independent union.

Union Bond Not Required

In another finding, the board declared that a labor union is not required under the Wagner law to post a bond guaranteeing performance of a collective bargaining contract. This ruling was made in a case directing the Jasper Blackburn Products Corp., St. Louis, to bargain collectively upon request with AFL's District No. 9 International Association of Machinists, as the exclusive representative of all of its machinists, tool and die makers and production employees. If an understanding is reached the board ordered that it be embodied, "upon request" in a signed agreement without requiring the union to post "a willingness to consummate any understanding that may be reached in a bilateral signed agreement." Therefore it was held that the company in seeking to condition its signing of a contract upon the union's posting of a bond guaranteeing performance of a contract, imposed a qualification inconsistent with the policy of the act.

"Even assuming a bond of the kind requested to be obtainable, the employer cannot lay down the blanket requirement that the union pay a tax to a surety company before the result contemplated by the act, a signed bilateral agreement, can come to pass," the board said.

Order for Walworth Co.

The board pointed out that since none of the proposals advanced either by the company or by the union, called for "any performance whatsoever on the union's part," it would seem clear that the primary purpose of the company's "demand for a bond was to avoid the required fundamentals of collective bargaining."

The board also has directed Walworth Co., Inc., Kewanee, Ill., manufacturer of valves and fittings "to cease and desist from discouraging membership" in SWOC's Amalgamated Association of Iron, Steel and Tin Workers, or any other labor organization and to disestablish the Valve and Fitting Workers' Union of Kewanee.

An election was ordered within 30 days among employees of the Westinghouse Electric & Mfg. Co., lighting division, Cleveland.

Reflecting Congressional hostility to the board because of maladministration of the Wagner Act by its majority members, the House by a teller vote of 160 to 90 rejected a motion by Representative Murdock, Democrat of Utah, to restore a $248,000 cut which the Appropriation Committee



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made in President Roosevelt's budget estimate of $3,180,000 for the board for the 1941 fiscal year. Mr. Murdock is one of two members of the Smith Committee investigating the board who opposed committee recommendations for changes in the Wagner act.

An "Agent of Moscow"

Bitter discussion centered around the board prior to the vote. The cut in its appropriation, Mr. Murdock charged, was designed primarily to lop off the board's division of economic research, headed by David J. Saposs, who has been vigorously assailed as a left-winger.

"There is more unfounded criticism of the National Labor Relations Act and its administration than any other act of Congress," declared Mr. Murdock. "This is an attempt to legislate and strike down part of the law."

Representative Tarver, Democrat of Georgia, denied that the Appropriations Committee had aimed the cut at Saposs and his division. At the same time his fellow Georgian, Representative Cox, bitterly denounced the board as a "Frankenstein monster" and said it had behaved "as if it were the agent of Moscow."

Representative Wood, Democrat, who is head of the Missouri State Federation of Labor, said the cut would "hamstring" the board to futility.

Commenting on the House action, Chairman Madden of the board said that the slash would "seriously impede the work of the board during the coming fiscal year and further delay the handling of labor disputes and the issuing of board decisions and their enforcement in the courts."

Board Member Leiserson, who frequently dissents from the majority, said it was a mistake to abolish the board's economic division.

Wage and Hour Division Cut

"If I may say so," Dr. Leiserson's letter said, "I think that those who are attempting to kill off the research division are shooting in the wrong direction. There is need for reorganization of the administrative division of the board, and a staff less heavily weighted with lawyers would be desirable. To provide a better balanced personnel the proportion of men trained or experienced in administration, economics and in labor relations needs to be increased and the proportion of lawyers decreased. The proposal to eliminate that part of the staff which is trained in economics and labor research therefore seems to me particularly unwise at this time."

The House also slashed the Wage and Hours division by $1,035,000 below the President's estimate. Nevertheless the $4,830,000 voted the division exceeds by $1,576,000 the present appropriation. The boosting of the funds for this bureau plainly means more activity to enforce the bogging Wage-Hour law.

Seaplane Tender Bids

WASHINGTON—The Navy Department will open bids on April 10 for constructing one set of propelling machinery for each of two small seaplane tenders. As security for the safe and prompt return of confidential plans, specifications and other bidders' data, the Navy will require from all bidders a deposit in the form of a certified check for $1000, payable to the Secretary of the Navy.



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Junior Boards of Directors Succeed for Some Companies

WASHINGTON—Management executives are reported to be manifesting a great deal of interest in a new approach to employer-employee relationships that have been developed in a number of companies throughout the country. Known as the multiple management plan, its advocates say that its success has attracted much attention.

Briefly, it consists of the selection by the employees of three junior groups of executives. These are the junior, factory and sales boards. These three boards are entirely self-governing but any recommendations which they may make as to policies or plans of the company, designed for the good of the business, are submitted to the senior board and the company president.

All affairs of the business, it is pointed out, are gone over with a fine-tooth comb, and the psychological effect is that every employee feels that he or she has a direct responsibility in the success of the company. Among these companies which have adopted the plan, it is claimed that most desirable results have been accomplished.

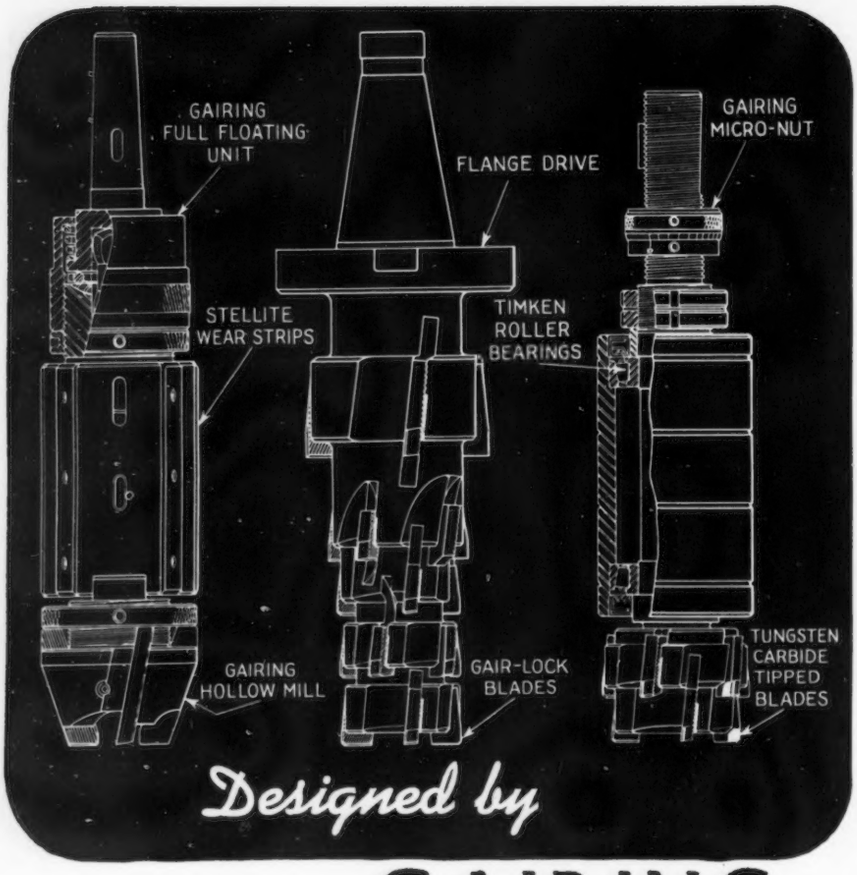
Received 2000 Suggestions

Charles P. McCormick, president of the McCormick Sales Co., Baltimore, originated the plan in 1932 when after 17 years as an employee he became the head of the business. He had the employee point of view and wanted to try out his theories. Since that time, according to his statement, the junior executives have submitted over 2000 suggestions to the senior board only a few of which have failed of adoption. According to Mr. McCormick, some 250 concerns employing 250,000 workers have adopted the plan in part or in its entirety.

With regard to the practical results that have come from the adoption of the multiple management system, Mr. McCormick says:

"Someone quite naturally will ask, 'has multiple management improved the profits of McCormick & Co. since you put it into effect in 1932'? My answer to this question is that it has enabled us to adopt a minimum wage scale for unskilled labor which is more than double what it was in 1929. For many years we have had a 40-hr. week, a week's vacation with pay for every factory employee, seven additional holidays with pay throughout the year and two daily rest periods of 10 minutes each during which the employees are required to leave their departments. Moreover, we have been able to give bonuses, increasing the amount of them each year during the last five years, while salaries are higher than they were during 1929.

"We have reversed the order in which the management previously considered various phases of the business. Before the introduction of multiple management, the customers were first, stockholders second, and the employees third. We have found that it is both pleasant and profitable to place the interests of the customers first, the employees second and the stockholders third."



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Gives Details of Lincoln $200,000 Award Program

FOR prospective participants, the James F. Lincoln Arc Welding Foundation, Cleveland, has prepared a 48-page brochure giving details of its second $200,000 Industrial Award Program, announced Jan. 1 of this year. The program is dedicated to general industrial progress through scientific development and application of arc welding.

Arc welding is emphasized as a process that has had great economic, social and commercial significance, and to it is attributed many of the benefits of progress in recent years. To extend that progress through encouragement of further study and application of arc welding is the aim of the present program.

The first Award Program, which opened Feb. 1, 1937, and culminated in September, 1938, with the distribution of 382 awards, stimulated wide response. It is believed that this further opportunity for those who study and work in the industry will result in even a greater mass of knowledge which can be disseminated with great benefit to industry as a whole.

The program provides awards in every field of industry where arc welding can be applied as a primary process of manufacture, fabrication, or construction; also where the process can be applied in specific welding services and in maintenance of structures and mechanical equipment.

To qualify as to subject matter, the machine, structure, building, manufactured or fabricated product redesigned or designed within the period of Jan. 1, 1940, to June 1, 1942, should have been either designed or redesigned and built within the period; or first built and manufactured within the period from studies or designs made prior to the period; or designed or redesigned within the period but not for some stated reason. Furthermore, the machine, etc., may be designed not only in whole but in part for use of arc welding. Other rules and conditions, including those for papers relating to welding service and maintenance work, are given at length in the brochure.

As to awards, there are 458 of them, totaling $200,000. An ingenious fold-in chart in the brochure enables prospective participants to see at a glance the system of awards in the 12 industry classifications and the 46 divisions thereof, and also the method of arriving at the main awards and the grand award, the latter totaling $13,700.

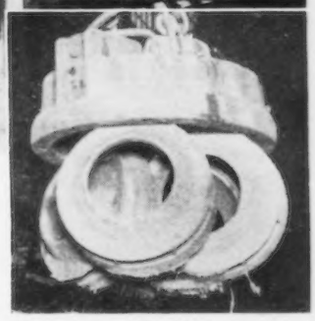
Of the 458 awards, 184 totaling $73,600 have been established for the best papers in the 46 industry divisions; 48 awards totaling $81,600 are for the best papers in the 12 industry classifications; three awards totaling $22,500 are for the three best papers of all submitted in the program. In addition, 223 awards totaling $22,300 have been established for papers judged worthy of honorable mention.

An author may win three of the awards. He may win one of four awards in his particular industry division; one of four in his industry classification; and one of three main awards of the program. Thus he may win $700 as a first divisional award, $3,000

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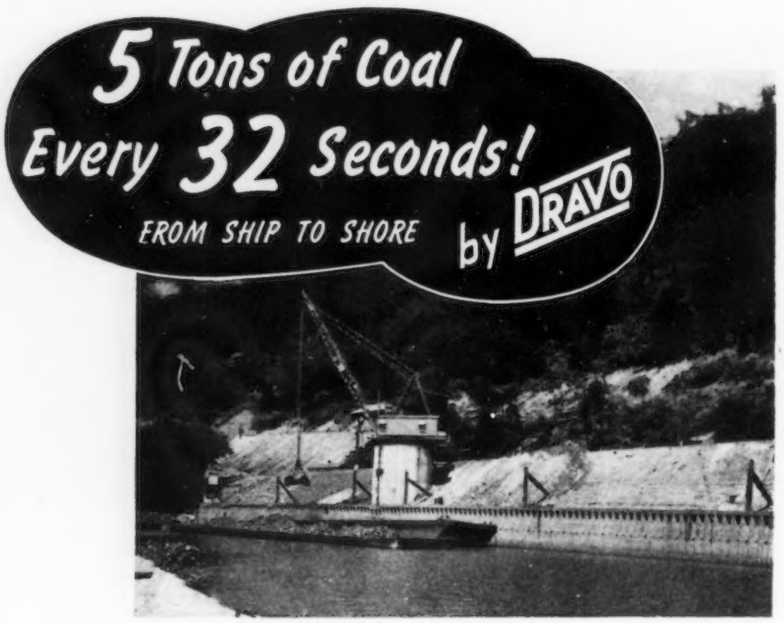
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as a first classification award, and $10,000 as first main program award, a total of $13,700.

Eligibility for participation in the award program, treatment and form of subject matter, and rules governing submission of papers are specified in the brochure. Factors considered in judging papers are outlined and data given on the jury of award, which is headed by Dr. E. E. Dreese, head of department of electrical engineering, Ohio State University, and chairman of the board of trustees of the foundation.

As a further convenience for prospective participants, some 25 pages of typical subjects for study, arranged by industry classifications and divisions, are listed in the brochure, and the lists are accompanied by more than 100 illustrations of typical products, machines, structures, etc., improved by arc welding. Although not exhaustive, this list will be found replete with suggestive detail, and important in helping participants classify their particular prospective contributions.

The brochure definitely reflects thorough planning and organization of this award program, not only to assure convenient and worthwhile participation, but to attract the quality and breadth of participation consonant with the high aims of the foundation. Copies of the brochure are obtainable from A. F. Davis, secretary, James F. Lincoln Arc Welding Foundation, P. O. Box, 5728, Cleveland.



THE Pittsburgh Coal Company's Smith Ferry Dock has ample barge accommodations to insure uninterrupted operation. A Dravo whirler mounted on the shore swings a five ton bucket from ship to shore and back to ship again in 32 seconds, which is moving coal in a hurry, as any dockman will say. A fast, simple, effective rig, it enables the Pittsburgh Coal Company's Smith Ferry Dock to enjoy an unusually low handling cost per ton.

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Bulletin 403 describes docks, mill foundations and terminal equipment. Bulletin 202 describes revolving cranes. Either will be sent upon request. Inquiries relative to specific problems may be addressed to

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C-I Superintendent Honored

CHICAGO—A banquet was given last week by the Gary Works Rollers Club of Carnegie-Illinois Steel Corp. in honor of R. B. Hancock, division superintendent of west mills in Gary works, who will retire May 1 after 31 years of service. Mr. Hancock, during his 31 years at Gary works, was in charge of the installation of virtually all the rolling mills, including all of the merchant mills, at the plant.

Principal speaker at the banquet, which was attended by 300 members and guests, was Walter E. Hadley, manager of operations of the Chicago district of Carnegie-Illinois. Other speakers were E. E. Moore, general superintendent of Gary works, and L. F. Burress, division superintendent of coke plant and blast furnaces. Paul E. Thixtun, assistant superintendent of industrial relations at Gary works, acted as toastmaster.

Baldwin Orders $2,058,095

ORDERS taken in February by Baldwin Locomotive Works and subsidiary companies, including Midvale Co., totaled $2,058,095, compared with $14,102,261 for February, 1939. The month's bookings brought the total for the consolidated group for the two months of 1940 to $5,614,577, as compared with $18,032,982 in the same period of 1939.

Westinghouse Honors 39

THE Westinghouse Order of Merit, a recognition of distinguished service, was conferred on 39 employes of the Westinghouse Electric & Mfg. Co. during 1939. More men received this medal and citation in 1939 than in any single year since inception of the order in 1935. It has been conferred on 124 Westinghouse employees since then.

French Official Denies Ore, Coal Exchange With Germany

REPORTS from Denmark and other neutral countries that Germany and France continued to exchange coal and iron ore to keep their steel plants in operation after the war began were denied this week by Anatole de Monzie, French Minister of Public Works.

M. Monzie's statement, carried in a dispatch to the New York *Times*, comes more than three months after publication by THE IRON AGE of a report from its correspondent at Copenhagen, Denmark, that coal-ore trade between the Reich and France was being carried on through Belgium. This report was published Dec. 21, 1939.

A similar denial that such trade between the two belligerents is being conducted as in peace time comes from Comptoir de Vente de la Sidurgie Belge (Cosibel), Belgian ore association, of Brussels, which declares that "iron ore which will be supplied (by France) to Belgium, in execution of the agreement in question, will be completely consumed in Belgium, and that coal and coke to be supplied to France will be completely and exclusively of Belgian origin."

Luxemburg's Industry

Still another "war anomaly," similar to the reported ore-coal exchange now denied in both France and Belgium, was claimed this week by THE IRON AGE correspondent at Hamburg, Germany, writes:

"Luxemburg is now a member of the French - Belgian - Luxemburgian pig iron cartel, which also controls the whole export trade. The central sales office is in Paris. The majority of the shares of the cartel is in French hands. Now Luxemburg is absolutely dependent upon supplies of coke and coal from Germany. Without these supplies three-fourths of the works would close down. These supplies are bartered for pig iron and steel. The pig iron for export to Germany (mainly foundry and Bessemer), is sold by the cartel and the invoices, etc., are made up in Paris for the account of the German buyers."

At Paris, M. Monzie told the New York *Times* that "the French are fighting the war without fraud or any secret combinations. On the very first day of the war all relations between Germany and France were broken. Coke and ore trains since Aug. 25 have been greatly diminished and I ordered them halted on Sept. 1.

Reich Holdings Under Seal

"German interests and holdings in France," continued M. Monzie," were placed under seal, among them the Jorsar Co., which represented the Saar industrialist Roechling. This shutdown was extended even to the interests controlled by the French in Luxemburg, so that the Hadir Co. no longer receives or makes use of German coke and no longer sells any steel to Germany.

"The Mulhouse mines are delivering now to the United States and Japan instead of Germany. As regards Belgium and Luxemburg, both neutral countries, France continues to furnish them with their allotment of



To operate Flange-Jacks: Remove opposite flange bolts, insert jaws of Flange-Jacks in holes and tighten. After removing other bolts, tighten down jackscrews together, separating flanges evenly.



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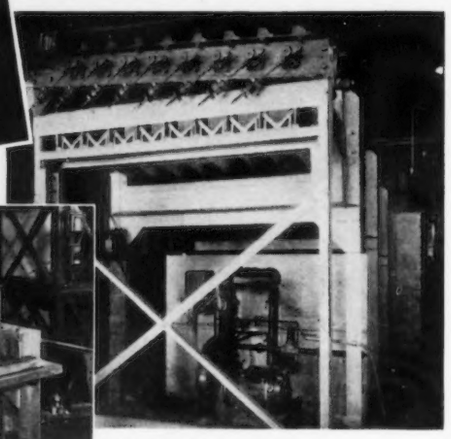
GARLOCK

iron in accord with their regular consumption, or only somewhat higher in view of the increased activity of their industries.

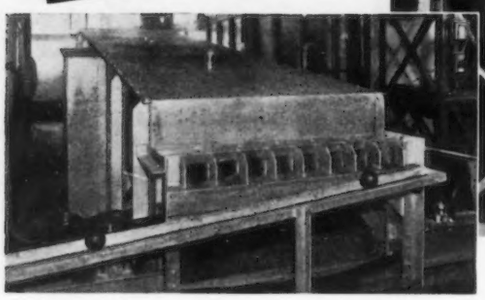
"The only coke delivered to France is produced in Belgian cokeries, and this is easily verified. French ore sent into Belgium and Luxemburg returns to France in the form of steel and Luxemburg sells to Germany minerals from her own soil, and there is no possibility of our ore going to Germany when we receive a corresponding quantity of steel for the ore shipped into neutral countries."

The French Minister of Public Works then said, according to the newspaper dispatch, that figures set forth by American publications were "completely fantastic." Cosibel, the Belgian association, declared, however, that the ore and coal exchange figures appearing in THE IRON AGE article of Dec. 21 were "normal." And that it could supply the coal mentioned, 4,000,000 tons, to France and that Belgium's annual requirements for iron ore are far above the 6,000,000 tons mentioned as the amount of ore which France would furnish Belgium. "A transaction comprising the tonnage of French iron ore you mention is not extraordinary," an official of Cosibel concludes.

Another SPECIAL DESIGN by "SALEM"



This view shows charging end of furnace—portion of automatic feeding mechanism in evidence at top.



View at left shows discharge end of furnace—also automatically operated.

12 TONS of 5" BALLS per 8 HOURS
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This capacity is based on heating grinding balls from cold to 600° Fahr. Hearth capacity 460 5" balls; consequent heating time 2¾ hours. This furnace has an equivalent capacity when handling 3" balls of 7 tons per 8 hours. This furnace is of the recirculating type and is fired with fuel oil.

Elevator raises balls to top of charging end where they roll, one by one, by gravity through automatic closing, flap type doors. The last door closes a limit switch which repeats the cycle. Balls feed by gravity through the furnace. At discharge end a chain driven mechanism automatically discharges one ball at a time onto a gravity conveyor just outside the furnace.

Completely automatic, the simplicity of design and operation of this furnace is typical of "SALEM" Engineering which has solved many a difficult and unusual industrial heating problem.

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SALEM ENGINEERING COMPANY

American Brake Shoe Acquires Chicago Company

W. B. GIVEN, JR., president, American Brake Shoe Foundry Co., New York, announces purchase of Great Lakes Forge Co., Chicago. The Great Lakes plant operates board and steam hammer equipment, varying in weight from 1200 to 10,000 lb. falling weight. Its forging machines and presses are used in coin pressing, sizing, and preliminary and finishing work to and from hammer equipment. The plant has ample die making capacity, and a modern heat-treating department.

American Forge Division of the Brake Shoe company, which will operate the Great Lakes Forge Co., specializes in upset forgings, and has the largest commercial upset plant in the world, with 37 forging machines ranging in size from 1½ in. to 8-in. units.

G. C. Hodgson, president of Great Lakes Forge Company, is retiring from active busines. He has been associated with the organization for 20 years.

Aluminum Mills for France

PITTSBURGH — Westinghouse Electric International Co. has sold more than 140 motors, generator sets, and controls for three mills to be used for rolling aluminum and which will be constructed in France. The rolling mill equipment will be furnished by United Engineering & Foundry Co. for the Societe du Duralumin and will be utilized in the manufacture of airplane materials. The electrical equipment, including a 750 hp. driving motor and four generator sets, will be built at the East Pittsburgh works of Westinghouse Electric & Mfg. Co.

Jessop Building Completed

JESSOP STEEL CO., Washington, Pa., manufacturer of special and alloy steels, announces completion of a new building where electroplating and arc welding equipment used in the production of composite steels will be installed.

Drive On Illness In Industry Begun

PITTSBURGH—An organized effort to reduce sick absenteeism throughout the heavy industries, source of "hidden" losses to management and labor alike, is being launched by Air Hygiene Foundation. The foundation, with headquarters at the Mellon Institute here is a national organization of industrial concerns for the advancement of industrial hygiene.

A preliminary report, "Sick Absenteeism in Industry," has just been released to the 200 member companies as the first step in the undertaking. Dr. A. J. Lanza, medical committee chairman, points out in this report that "eight plus days per male wage earner and 12 plus days per female worker per year is the average toll paid to disabling sickness and injury—a truly staggering total whether viewed from the point of health or of money loss and at least five times greater than the corresponding figure for industrial accidents."

There are three steps in the program: First, the preliminary report which has been completed and which attempts to picture the problem for management; secondly, the keeping of records on sick absenteeism by the participating companies on prescribed forms, and, thirdly, the analysis of these records, which will be held strictly confidential. This analysis is expected to yield specific ways and means whereby the participating companies can cut down their number of lost workdays through sick absences. Cooperating with the foundation in the study are the U. S. Public Health Service and the American Association of Industrial Physicians and Surgeons.

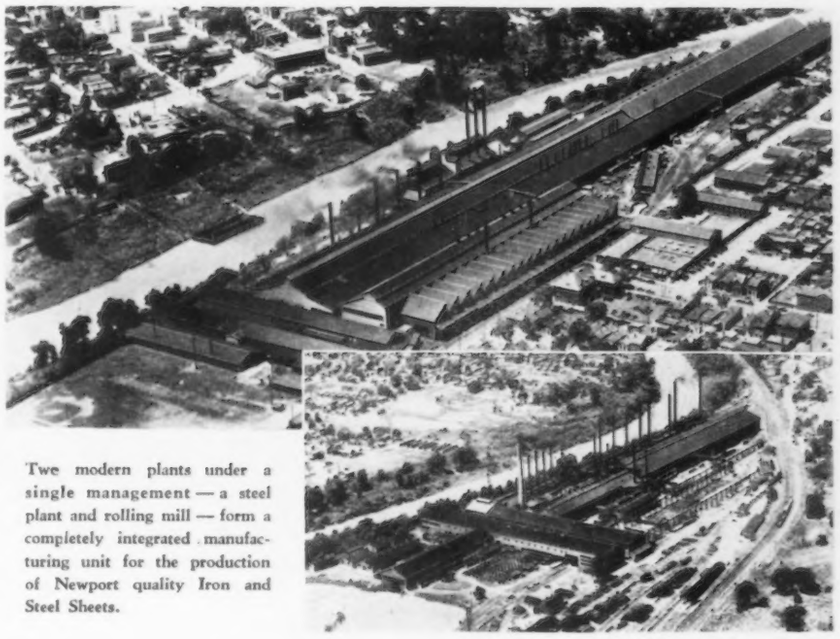
Allegheny Ludlum Orders Above Same 1939 Period

PITTSBURGH — Although orders received for January and February have not continued at the high level of the last quarter of 1939, they still represent an advance of 27 per cent over the corresponding period in 1939, W. F. Detwiler, board chairman, and H. G. Batcheller, president, Allegheny Ludlum Steel Corp., indicated in presenting the company's 1939 annual report.

An interesting breakdown in the report shows that salaries of officers, including value of stock delivered as part of remuneration, amounted to 1.2 per cent of total receipts, all other wage and salary payments amounted to 31.8 per cent, raw materials, fuel and power, supplies, maintenance, and repair material amounted to 49.5 per cent, selling and administrative expense excluding salaries 3.9 per cent, total taxes 4 per cent, depreciation and depletion 3.6 per cent, and net profit for 1939 5.6 per cent.

Net income for 1939 amounted to $2,093,518, or $1.49 a share after preferred dividends, compared with a net loss of $1,070,186 in 1938. Sales in 1939 were $37,322,141, compared with $18,261,231 in 1938.

The company's report mentions a new tool steel of tungsten molybdenum type which was placed on the market during 1939, a new finishing process for stainless steel known as Anodic Lustre, expansion of the company's foundry at Buffalo, and the development in 1939 of Pluramelt steel, which recently was publicly announced.



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Morehead Medal to Otto C. Voss

FOR "continuous pioneering, untiring educational effort, and constructive sponsorship of oxy-acetylene process applications," Otto C. Voss, advisory superintendent of the tank and plate shop of the West Allis, Wis., plant of the Allis-Chalmers Mfg. Co., will receive the 1939 James Turner Morehead Medal sponsored by the International Acetylene Association. Awarded annually for outstanding work in the production or utilization of calcium carbide and acetylene gas, the medal will be presented to Mr. Voss at the opening session of the association's 40th annual convention, to be held April 10-12, at Milwaukee.

A few years after coming to this country at the age of 10, Mr. Voss began to learn the trade of boilermaker. Later as superintendent of boiler work for a large copper mining company, he began what turned out to be a lifelong interest in promoting the practice of welding. Under his direction were produced the first oxy-acetylene welded pressure vessels to pass the codes of regulatory bodies and testing organizations, and his direction of the fabrication of this equipment has done much to spread knowledge of these accomplishments and to encourage the acceptance of oxy-acetylene methods in the manufacture of all kinds of steel products.

Mr. Voss became associated with the Allis-Chalmers company in 1905 and since has guided many advances in metal fabrication procedures developed and adopted by that organization. He is credited with having installed and used the first oxy-acetylene shape-cutting machine in the Middle West, and he organized the production of shape-cut parts on a routine basis in the Allis-Chalmers plants. Some of the equipment first cut on the shape-cutting machine and welded by the oxy-acetylene process were plates for pressure vessels which are still in use after more than 30 years of service. Today, at 78, Mr. Voss maintains active contact with progress in metal fabrication.

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Machinery Found to be Aid to Employment

EMPLOYMENT statistics proving that the use of labor saving machinery has not resulted in additional unemployment were cited by Edgar M. Queeny, president, Monsanto Chemical Co., at the annual stockholders' meeting in St. Louis last week.

Mr. Queeny said that the total employed in manufacturing in December, 1939, was only 0.34 per cent less than the 1929 figure, while the number employed in other productive enterprises ranged from 5 to 35 per cent less than 10 years ago. Mr. Queeny showed by these facts that manufacturing, the greatest user of labor saving machinery, employed virtually as many people at the close of 1939 as in 1929, while building, using the least amount of labor saving equipment, made the poorest comparison, being off 35 per cent from 1929.

"Industries which have been subject to excessive Government regulation and Government competition," he said, "such as transportation and public utilities, also compare unfavorably, and there are fewer farmers required in agriculture under the restricted production policy of the Government."

Gear Makers Complete Meeting Program

A FULL program of technical papers, technical standardization committee reports and addresses on commercial topics has been arranged for the 24th annual meeting of the American Gear Manufacturers' Association, to be held at Grove Park Inn, Asheville, N. C., May 20-22.

Papers include: "Cutting of Fine Pitch Gears," by D. T. Hamilton, engineer, Fellows Gear Shaper Co., Springfield, Vt., "Recent Developments in Welded Gears and Gear Cases," by Everett Chapman, president, Lukenweld, Inc., Coatesville, Pa., "Boring Mills in a Gear Shop," by E. P. Blanchard, sales manager, Bullard Co., Bridgeport, Conn., and "My 40 Years' Experience with Tooth Forms," by A. A. Ross, engineer, General Electric Co., West Lynn, Mass.

Also, "Tooth Bearings for Straight and Curved Tooth Bevel Gears," by A. H. Candee, engineer, Gleason Works, Rochseter, N. Y., "Pitting in Gears and Roller Tests," by Dr. Stewart Way, Westinghouse Electric & Mfg. Co., and "Diesel and Gas Engine Load Characteristics," by Austin Kuhns, executive engineer, Farrel-Birmingham Co., Ansonia, Conn. W. L. Schneider, Falk Corp., Milwaukee, and chairman of the association's commercial committee, will address the convention on "How's Business?"

Charles F. Goedke, president, Ganschow Gear Co., Chicago, is president of the association, and J. C. McQuiston, Shields Building, Wilkinsburg, Pa., is manager-secretary.

9,116,930 Tons of Iron Ore Mined in Michigan in 1939

LANSING, Mich.—The State Geological Survey reports that 9,116,930 tons of iron ore was produced in Michigan in 1939. Ore shipments totaled 11,139,895 tons, thus reducing surplus stocks at the mines.

C-I to Keep Farrell Mills

FARRELL, Pa.—Carnegie-Illinois Steel Corp.'s tin mill plant here will not be abandoned, J. L. Perry, president, told civic officials last week. The tin plate plant was shut down two months ago due to lack of business but equipment has been kept in shape so as to be available on a resumption of large scale tin plate buying.

Republic Plans Pilot Plant For Iron Ore Treatment

CLEVELAND—Plans for construction of a small iron ore treatment plant at Spaulding mine, Birmingham, Ala., have been made by Republic Steel Corp. The unit will be a pilot plant to be used for experimentation in improving the quality of iron ore.

Iron ore in the vicinity of Grace's Gap and northward on Red Mountain which is to be treated is too siliceous to be used economically in a blast furnace for the manufacture of satisfactory iron, according to Republic. The company is therefore experimenting on a process for concentration. Much experimental and research work on the ore of this district has been done during the past several years by metallurgists of the section, including the U. S. Bureau of Mines and an experimental station at the University of Alabama.

The plant will be built adjacent to the tipple at the Spaulding mine.

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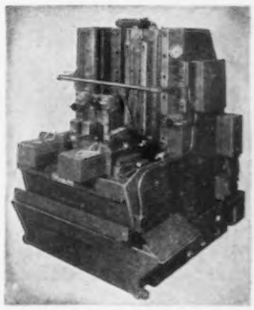
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Type FHP welds stand the gaff in these stripping tongs made by Shaw-Box Crane & Hoist Co.



Welders qualify readily with Type FHP for code welded work like this butane tank, made by Southwest Factory, Oklahoma City.

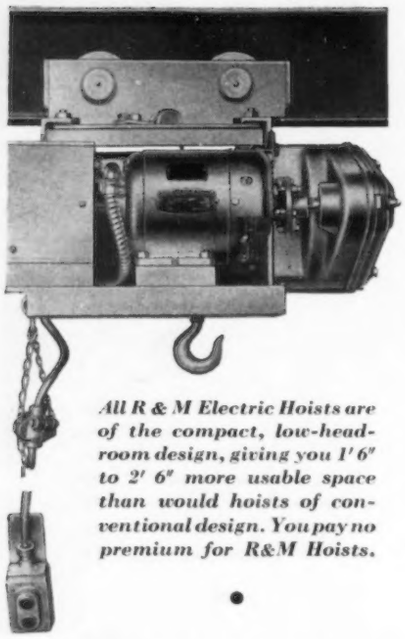


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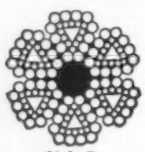
If you have a hoisting problem we'd like to talk it over with you. An experienced "outsider" can often provide the fresh slant that points to a simple, profitable solution.

For instance, you may have an involved puzzle—one that our engineers could solve for you by designing special equipment as we have done time after time for all types of businesses. Or, the simple installation of a standard R&M all-steel, low-headroom hoist may provide the answer. This particular hoist, one of nearly 2,000 "stock" R&M models, can be had in 1-ton capacity, to make a 20-foot lift in 30 seconds, or 2-ton capacity that lifts the same distance in one minute flat. Both are available with plain or motor-driven trolley and push-button control.

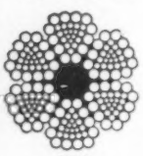
In any case, let's talk over your hoisting problems, with no obligation on your part, of course. Our different point of view may permit us to make a valuable contribution. Write a letter today, to:

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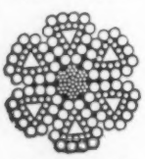
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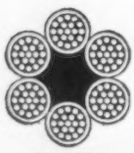
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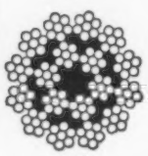
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Canadian Business Expand; More War

TORONTO—The Canadian iron and steel industry continues to show progress in production and new business. Releasing of war contracts by both the Canadian and British governments is reaching a broader scale and Canadian plants now show definite indications of increased activities directly resulting from war orders. In addition ordinary domestic demand for iron and steel and their products is gaining steadily and export demand for steel also is having a stimulating effect on business to primary steel producers in this country as well as aiding activities of many secondary plants. To assist in supplying the extraordinary demand for steel required in Canada for war and ordinary consumption needs, imports from the United States have more than doubled in the first two months of this year compared with the corresponding period of 1939. Machinery and machine tool purchases from across the line also have shown a big increase.

In recent weeks Canadian purchases of United States steel and equipment have shown further improvement and include large tonnages of plates for shipbuilding operations on this side of the border. Inquiries continue to pour into local offices of American steel companies and there is a fair rush by consumers and warehouse operators here to cover increasing spot needs and requirements for the next two or three months which will be in excess of Canadian production.

While Canada's imports of iron and steel have jumped sharply in recent months, exports of iron and steel materials from this country have shown equally important gains, and further

Imports of Metal-Working Machinery Into Canada, February, 1940

Classification	United States	United Kingdom	Total All Countries
Drilling and boring machines	$90,226	$3,308	$94,048
Grinding machines	52,177	1,757	53,934
Lathes	190,813	2,430	193,243
Milling machines	62,208	3,303	65,511
Planers	495	....	495
Presses	18,687	...	18,687
Rolling mill machines	52,937	...	52,937
Shapers and slotters	19,150	621	21,025
Not otherwise listed	291,546	6,932	312,811
Grand Totals	$778,239	$18,351	$812,691

Source: Dominion Bureau of Statistics.

Continues to Orders Placed

extensive export business is indicated. Announcement has just been made that orders involving upward of $3,000,000 have been placed with Canadian steel mills by the South African Railways and Harbor Administration, South Africa. This order, which will be divided about equally between the Dominion Steel & Coal Corp., Sydney, N. S., and Algoma Steel Corp., Sault Ste. Marie, Ont., is for 57,000 tons of steel rails. In addition the Algoma Steel Corp. has received from the same source an order to supply 85,000 pairs of fish plates.

British Placing Orders

The British Government is placing large orders direct with Canadian companies for manufacture of war materials, including guns, munitions, etc., in addition to those going through the Canadian War Supply Board at Ottawa. British authorities also are assisting several Canadian concerns in financing plant additions and installation of special equipment to handle this special business. In this respect announcement is made that additions are underway to the plant of Robert Mitchell Co., Belair Avenue, Montreal, which with equipment will cost $300,000, for production on a large scale of war materials. This undertaking will be financed under the contract with the British Supply Board.

Canadian rolling stock builders are assured of additional large contracts from Canadian railroads which, it is stated, will be in sufficient volume to keep plants running almost at full time for the remainder of the year. Since the latter part of 1939 builders have been engaged on production of rolling stock to the value of $25,000,000 for the Canadian National and Canadian Pacific railways, and these orders are supposed to be cleaned up by the end of June, with the exception of locomotive orders which will not be finished until the fall. In the next few weeks orders for $1,500,000 in rolling stock will be placed by the Canadian National Railways with Canadian plants. Of the more important rolling stock orders are those for $10,000,000 forecast in the 1939 annual report of Canadian Pacific Railway Co. In this respect the Canadian Pacific plans to purchase 29 locomotives, 1300 freight cars, and 10 mail and express cars.

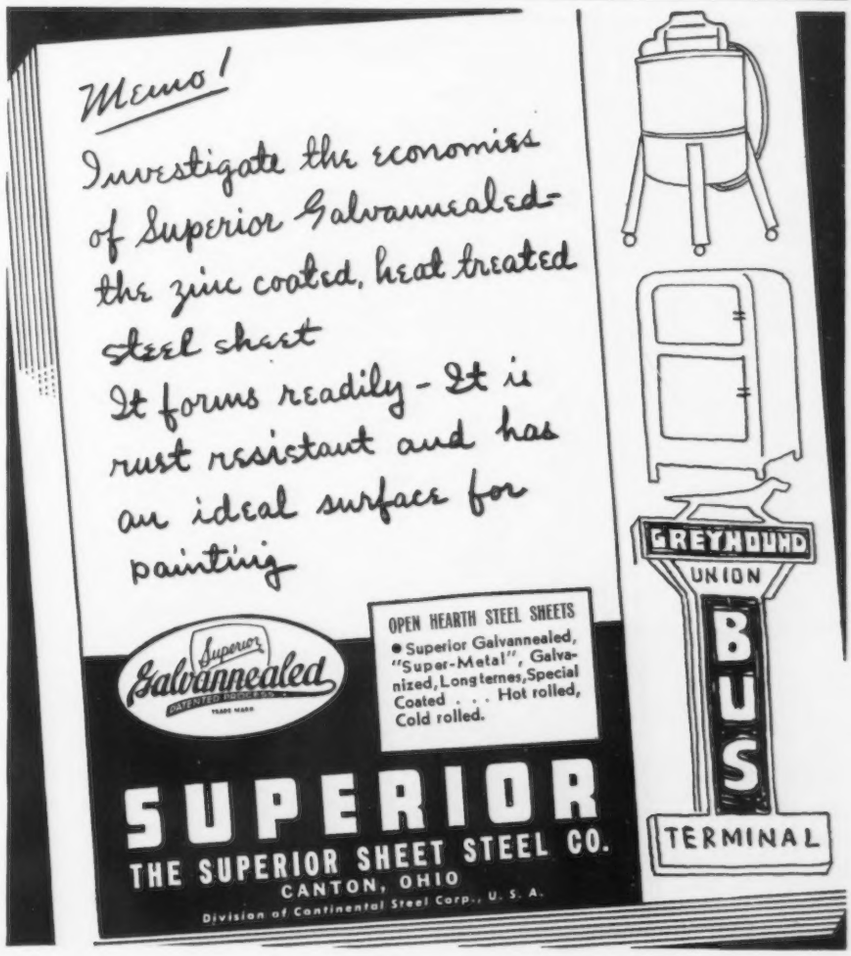
The C. P. R., also will spend $514,200 for ordinary additions and betterment to rolling stock. Further large



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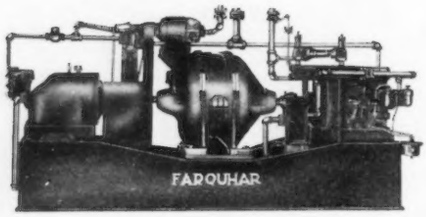


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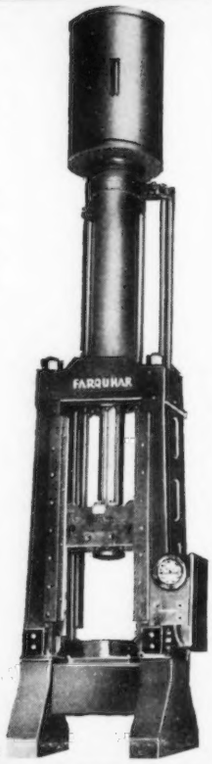
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orders also are expected from the Canadian National Railways.

War Contracts

Orders placed by the War Supply Board during the week had total value of $1,726,151 and included:

Aircraft supplies: Ontario Hughes-Owen Co., Ltd., Ottawa, $433,786; Instruments, Ltd., Ottawa, $220,773; Canadian Pratt & Whitney Aircraft Co., Longueuil, Que., $185,000; Fairchild Aviation Corp., Jamaica, N. Y., $133,123; British Air Ministry, $112,794; MacDonald Brothers Aircraft, Ltd., Ottawa, $7,214; Robert Marshall, Ottawa, $5,623; Aviation Electric, Ltd., Montreal, $11,802.

Machinery and tools: Delamere & Williams, Ltd., Toronto, $12,960.

Barracks Stores: Beatty Brothers, Ltd., Fergus, Ont., $27,500; Dowswell Lees & Co., Ltd., Hamilton, $6,860.

Construction: Frontenac Construction Co., Ltd., Toronto, for construction of R.C.A.F. buildings, Camp Borden, $34,695; Custodis Canadian Chimney Co., Ltd., Montreal, for work at Dominion Arsenal, foundry and rolling mill at St. Malo, Quebec City, $11,985; Cars-Hall-Aldinger Co., Ltd., Vancouver, B. C., for work at R.C.A.F. station at Patricia Bay, B. C., $8,953. The Public Works Department, Ottawa, has awarded contract to Angus Robertson Co., Montreal, for extension of No. 3 wharf and other work at naval drydock at Halifax, N. S., to cost $425,000.

Canadian Pig Iron, Steel Output Lower in February

OTTAWA, ONT.—Production of iron and steel in Canada during February dropped sharply below that of the month immediately preceding, partly due to the shorter month.

Pig iron production amounted to 87,032 gross tons, down from the record 104,703 tons in January, and included 72,893 tons of basic iron, 3572 tons of foundry iron and 10,567 tons of malleable iron. On Feb. 26 Algoma Steel Corp., Sault Ste. Marie, Ont., banked a 450-ton blast furnace, leaving seven active furnaces in Canada at the end of the month.

Production of ferroalloys in February totaled 7711 tons against 8065 tons in January.

Output of steel ingots and direct steel castings for February amounted to 140,343 gross tons, down from 166,496 tons in January.

SWOC Loses, 1008 to 809

PITTSBURGH—Hourly workers at the Beaver Falls plant of the Babcock & Wilcox Tube Co. at an NLRB election last week rejected the SWOC as an exclusive bargaining agent by a vote of 1008 to 809. Only 33 eligible employees failed to vote. The SWOC had and still has a contract on behalf of its members only. However, it recently claimed a membership of 1575 in the plant and on that basis made a claim for sole bargaining rights.

Hook to Testify at "Trial" of Machine

WASHINGTON — Expected to testify before the Temporary National Economic Committee during the committee's technological development inquiry to begin April 8 will be Charles R. Hook, president of the American Rolling Mill Co., Middletown, Ohio. It was indicated that the steel industry will be first to receive the attention of committee members on or about the third day of the hearings.

No steel industry representative was included early this week in an unofficial list of witnesses but committee attaches described the list as only tentative. It included the following among others:

For industry—Edsel Ford, president, Ford Motor Co.; Paul Hoffman, president, Studebaker Corp.; C. F. Kettering, vice-president, General Motors Corp.; T. J. Watson, president, International Business Machines Corp.; Martin W. Clement, president, Pennsylvania Railroad and E. E. Norris, president, Southern Railway System.

For labor—William Green, AFL president; Philip Murray, chairman, Steel Workers Organizing Committee, (CIO); George Harrison, president, Brotherhood of Railway Clerks and AFL vice-president; James Carey, president, United Electric, Radio and Machine Workers of America, (CIO); R. J. Thomas, president, United Automobile Workers of America, (CIO); Tom Kennedy, United Mine Workers of America, (CIO).

For the Government—Dr. Isador Lubin, Commissioner of Labor Statistics, Department of Labor; Carl Taylor, Sherman Johnson, Fowler McCormack, Department of Agriculture.

Educators—Paul Taylor, professor of Agricultural Economics, University of California; Dr. John Norton, Columbia University; William Carr, National Education Association.

The hearings will be under the direction of Dr. Theodore J. Kreps, economic consultant for the TNEC. Another Stanford University professor, Dr. H. Dewey Anderson will assist. Presiding will be Senator Joseph H. O'Mahoney, TNEC chairman, who introduced a bill in Congress to "balance men with machines" after the TNEC decided to survey the subject of technological advances and their effect upon labor.

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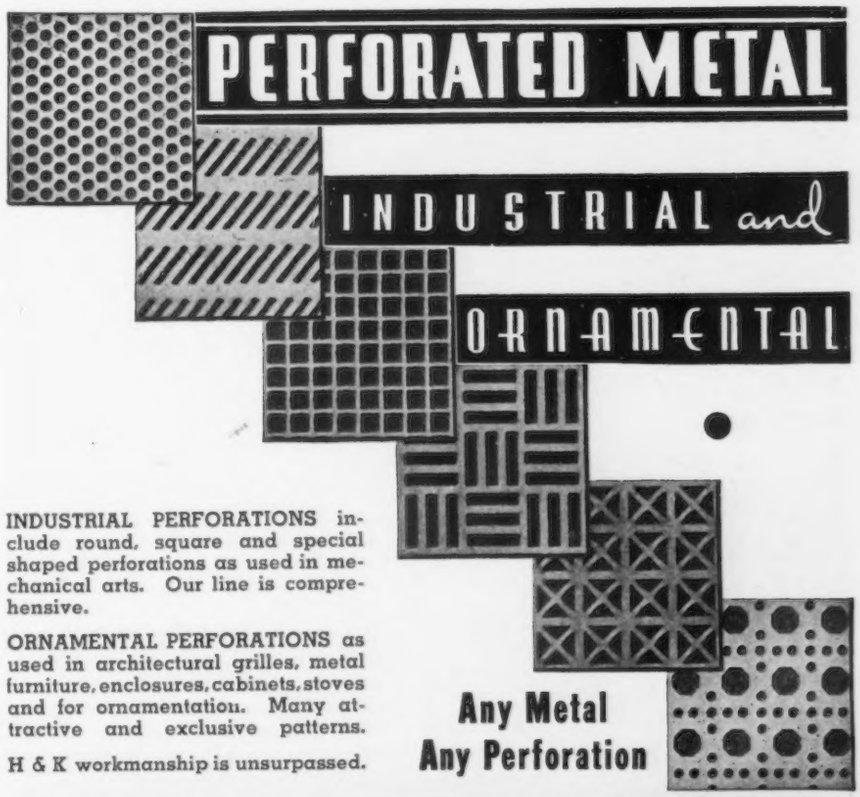


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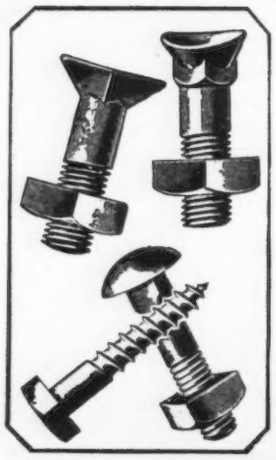
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March Pig Iron Output Drops Almost 8%

PRODUCTION of coke pig iron (partly estimated) in March totaled 3,260,000 net tons, compared with 3,311,480 tons in February. On a daily basis March output dropped almost 8 per cent from that in February, or from 114,189 net tons to 105,160 net tons in March. The rate of operation dropped to 68.9 per cent of the industry's new capacity of 149,687 net tons of coke pig iron a month from 75.1 per cent in February.

There were 151 furnaces in blast on April 1 compared with 157 in operation on March 1. The United States Steel Corp. blew out or banked three furnaces, independent producers blew three in and took two off blast, and merchant producers blew out or banked four furnaces.

Among the furnaces blown in were: One Lackawanna, Bethlehem Steel Co.; one Haselton, Republic Steel Corp., and one Campbell, Youngstown Sheet & Tube Co.

Furnaces blown out or banked included: One Palmerton, New Jersey Zinc Co.; one Duquesne, one Farrell, one South Chicago (old), Carnegie-Illinois Steel Corp.; one Perry, Interlake Iron Corp.; one Sharpsville, Pittsburgh Coke & Iron Co.; one River and one Pioneer, Republic Steel Corp.; and one City, Sloss-Sheffield Steel & Iron Co.

Bessemer Process Revival Discussed By H. W. Graham

PITTSBURGH—Today's economic trends contain elements favorable to a revival in the bessemer process of steel making, H. W. Graham, director of metallurgy and research, Jones & Laughlin Steel Corp., told members of the Pittsburgh section of the AIMME, the AIMME national bessemer committee, and the steel works section of the Engineers Society of Western Pennsylvania here this week.

Mr. Graham discussed the many factors affecting control of the bessemer process and developed fundamental considerations involved in the control of iron temperature and quality of air blast volume and moisture content. He also stated that if the bessemer process were given only a small part of the lavish attention provided for the open hearth process, it might retain its proportionate place.

Steel Union Organizer, Dies Witness, Cited for Contempt

WASHINGTON — George H. Powers, Pittsburgh, who identified himself as a Communist and as an organizer for the CIO's Steel Workers Organizing Committee, was cited Tuesday for contempt of the House of Representatives for refusal, when recently before the Dies Committee investigating un-American activities, to shed light on the issuance of a Communist party membership book containing the forged name of Franklin D. Roosevelt. Likewise Powers declined to produce records of the Communist party or to name any other Communists. Powers, native of Russia, where he was born 35 years ago, also refused to tell the committee anything about his two brothers. He taxed the committee's credulity when he said he could not recall his former name.

Associated with Powers in the House contempt citations are James H. Dolsen, Pittsburgh Communist leader, and Dr. Albert E. Blumberg, Baltimore, secretary of the Communist party for Maryland and the District of Columbia. In the possession of Dolsen was found the Communist card bearing the name of Franklin D. Roosevelt, but Dolsen declined to identify the persons responsible for the issuance of the card. Blumberg will be summoned before the committee and required to identify the persons whose names were found in records seized at Communist headquarters in Baltimore.

Powers told the committee that he joined the Communist party in St. Paul in 1925 and has been a member ever since, said he was once an organizer for an American Federation of Labor textile union in Allentown, Pa., and that after working in 1926 and 1927 for the United States Bedding Co., he worked for the Bethlehem Steel Co. He said that he had been an agent for the Amalgamated Association of Iron, Steel and Tin Workers in 1933, and later served as an SWOC organizer.

It is recalled that Powers when testifying before the Senate Committee on Education and Labor, in April, 1934, in support of the Wagner Labor Bill, said he was a representative of steel workers at the Sparrows Point, Md., plant of Bethlehem Steel. At that time he attacked the steel company in connection with the conduct of an election to determine a collective bargaining unit. Remindful of his attitude before the Dies Committee, Powers refused to tell the Senate Committee the names of his companions and delegates in attendance at the hearing.

New Bids on Hangers Sought

WASHINGTON—The Public Building Administration, Federal works agency, has announced that it will take supplementary bids for construction of three large hangars and a terminal building at Gravelly Point, Va., which, it is estimated, will require about 3000 tons of structural steel and approximately 1600 tons of reinforcing bars. Bids already submitted exceed the appropriation of $2,500,000 for the project and it will be necessary to change specifications.

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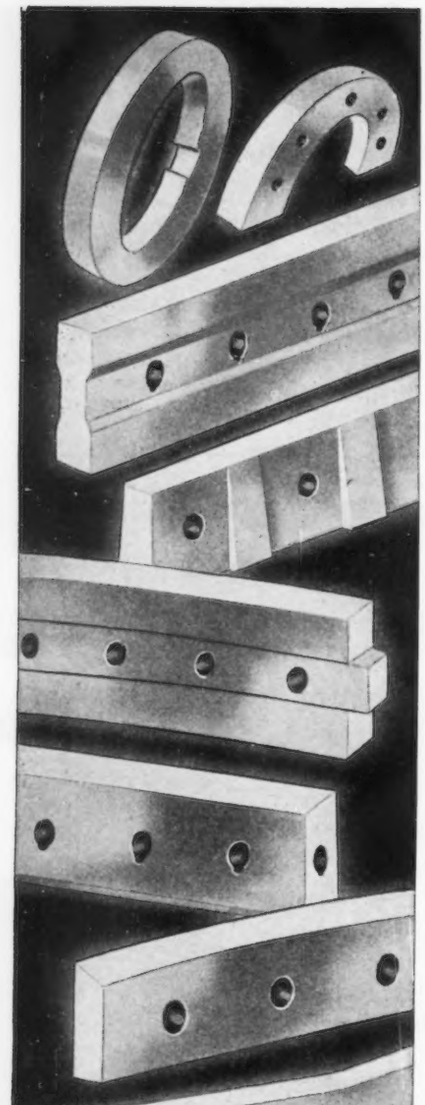
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Inspect New York's Largest All-Welded Building

THE largest all-welded building erected in New York City to date, namely the Union Airlines Terminal, at Forty-second Street and Park Avenue, on the site of the old Belmont Hotel, opposite the Grand Central Terminal, was inspected March 30 by more than 50 members of the New York section of the American Welding Society.

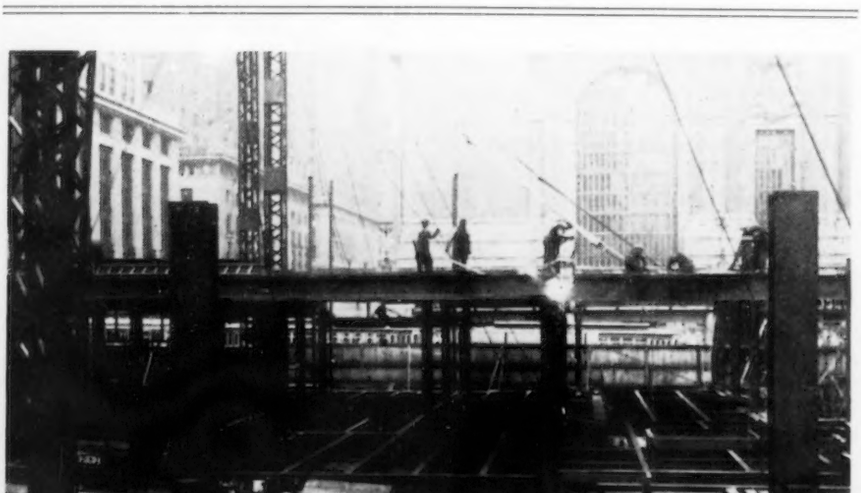
The building, designed by John B. Peterkin, architect, comprises five stories above the street level and four below and will be occupied by five airlines. The Bethlehem Engineering Corp. is general contractor. The steel, amounting to about 1350 tons, was fabricated by the Lehigh Structural Steel Co. and erected by the Lehigh Construction Co. Jacob Langfur was consulting engineer and Gilbert D. Fish, structural steel welding consultant. General structural features and details of welding were explained by Mr. Langfur and Mr. Fish during the inspection trip.

In addition to bus terminal and office facilities, the building will house a number of stores on the street level and also a Newsreel theater. Due to these varied facilities and to the necessity to distribute the weight of the building to subway girders below in a manner which would not overload the latter, the building incorporates several unusual structural features.

Most interesting, perhaps, are the two large all-welded trusses, thought to be the largest ever fabricated by welding, and the deep all-welded plate girders. The trusses have a span of 70 ft. and weigh 30 tons each. The top and bottom chord members are 14-in. rolled H-sections. The end reactions on these trusses is 800,000 lb., while the tension in the bottom chord at the field splice amounts to 1,800,000 lb. At one end, these trusses frame into short heavy welded plate girders more than 6 ft. deep. It was necessary to resort to these heavy trusses inasmuch as columns could not be permitted either in the theater or in the bus terminal floors. The trusses support part of four floors and the roof above them, and a considerable part of the terminal floors hung below them.

Other interesting elements are the long-span welded beams over the terminal floor, which are better than 50 ft. long and weigh about 11 tons each. In order to provide storage and loading facilities for the airplane connection buses it was necessary to build a ramp from the 41st Street side of the building down to a garage located in one of the sub-cellars. There are two storage levels for buses.

Interesting also is the fact that the new steel had to be connected to old box columns of the Belmont Hotel in the 41st and Park Avenue walls and also to existing double-plate girders over the roof of the subway structure below the building. These connections would have been difficult and expen-



Union Airlines Terminal, opposite Grand Central Terminal, New York, in process of erection by the Lehigh Construction Co. Features include two 70-ft. span, 30-ton trusses, believed to be the largest ever fabricated by welding. (Photo by courtesy Wilson Welder & Metals Co., Inc.)

sive by any other process than welding and cutting.

Structural members were both butt and fillet welded and it was observed that use was made of slots in the trusses, etc., to make additional perimeter for welding. Arc welding, with machines furnished by the Wilson Welder & Metals Co., subsidiary of the Air Reduction Co., Inc., was employed in erection of the structural steel. In common with other arc welded structural projects the quietness with which this building was erected was noteworthy.

CAST IRON PIPE

Alvord, Tex., plans pipe lines for water system and other waterworks installation, including elevated steel tank and tower. Cost about $35,000. Freese & Nichols, Capps Building, Fort Worth, Tex., are consulting engineers.

Dakota City, Neb., asks bids until April 11 for pipe for water system extensions and replacements; also for gate valves, boxes, fittings, etc.

Hawkins, Wis., closes bids April 9 for 10,000 ft. of 6-in. pipe for water system; also for about 7000 lb. of fittings, 24 6-in. gate valves, fire hydrants, etc. General Engineering Co., Portage, Wis., is consulting engineer.

Board of Directors, LaFourche Parish Water District, Thibodaux, La., recently organized, care of Cameron Mattingly, Thibodaux, president, plans pipe lines for water system from upper end of Parish, along Bayou LaFourche, to Golden Meadow district. Cost about $600,000. Special election has been called April 30 to vote bonds in that amount.

Water Bureau, Erie, Pa., plans pipe line extensions in water system in Peninsula district. A. N. Aitkin is city engineer.

Town Board of Commissioners, Town Hall, Frewsburg, N. Y., plans pipe lines for water system and other waterworks installation. Cost close to $100,000. Bond issue will be arranged soon. W. S. Lozier, Inc., 10 Gibbs Street, Rochester, N. Y., is consulting engineer.

Antlers, Okla., plans pipe line extensions and replacements in water system; also other waterworks installation. Fund of about $104,000 has been arranged through Federal aid for this and sewage system.

Mesquite, Tex., plans pipe lines for water system and other waterworks installation. Fund of about $35,000 is being arranged for this and extensions in sewage system. Special election has been called to approve bond issue. Koch & Fowler, Great National Life Building, Dallas, Tex., are consulting engineers.

Teneha, Tex., plans pipe lines for water system and other waterworks installation. Cost about $46,000, of which $28,500 will be a bond issue. Freese & Nichols, Capps Building, Fort Worth, Tex., are consulting engineers.

Sacramento, Cal., has awarded 140 tons of 6, 8 and 14-in. pipe to American Cast Iron Pipe Co., San Francisco.

United States Engineer, Los Angeles, will take bids April 25 for construction of Fullerton Dam, near Placentia, Cal., involving quantity of 12-in. cast iron pipe.

Los Angeles Department of Water and Power will take bids April 8 on 40,000 ft. of 8-in. pipe.

Atlas Forge Plant Operates Despite Fire

LANSING—Fire destroyed the roof of the heavy-press plant of the Atlas Drop Forge Co. on Monday, causing a loss estimated at $5,000 but not blocking production.

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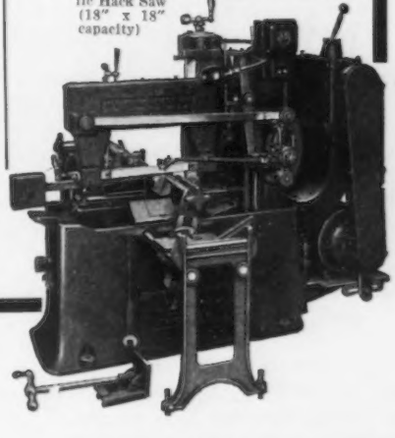
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9 MARVEL No. 9 Heavy Duty High Speed Saw (10"x10" capacity)
9A MARVEL No. 9A, Automatic Production Saw with Heavy Duty Bar Push-up (10"x10" capacity)
18 MARVEL No. 18 "Giant" Hydraulic Hack Saw (18" x 18" capacity)



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. . . THE NEWS IN BRIEF . . .

Ford Motor Co. will adopt a different type of engine for its six.—**Page 56.**

Senate Military Affairs Committee upholds releases of aircraft for foreign sale.—**Page 60.**

400 more inspectors to be in field by April 16 to enforce Fair Labor Standards Act.—**Page 60.**

Department of Commerce plans trade-o-graphs to show monthly business trends.—**Page 62.**

Central Statistical Board to continue inquiry into identical bids and Government buying practices.—**Page 62.**

British India's exports of manganese ore increase by third.—**Page 62.**

Maritime Commission, ahead of 50-ships-a-year goal, plans 15 ships, requiring 87,420 tons of steel, in 1940.—**Page 64.**

British plan to increase exports to South America—**Page 65.**

Ten per cent increase in business is reported by General Malleable Corp., Waukesha, Wis.—**Page 66.**

Program prepared for annual Chamber of Commerce meeting.—**Page 67.**

ICC orders reduced freight rates on carlot scrap shipments from Southern points.—**Page 69.**

Labor Board recognizes property rights in passing on packing house complaint by CIO.—**Page 69.**

Navy will open bids April 10 on seaplane tender propelling machinery.—**Page 71.**

Junior boards of directors found profitable by some companies.—**Page 72.**

Details of Lincoln $200,000 arc welding award program are given in brochure ready for distribution.—**Page 73.**

Baldwin Locomotive Works orders received in February, $2,058,095, contrasted with $14,102,261 in like month of 1939.—**Page 74.**

Thirty-nine employees receive Westinghouse Electric & Mfg. Co. order of merit.—**Page 74.**

Gary Works Rollers Club holds banquet honoring R. B. Hancock, Carnegie-Illinois division superintendent.—**Page 74.**

French official denies ore, coal exchange with Germany.—**Page 75.**

Jessop Steel Co., Washington, Pa., completes new building.—**Page 76.**

American Brake Shoe & Foundry Co. purchases Great Lakes Forge Co., Chicago.—**Page 76.**

Rolling mill equipment, motors for new aluminum mills in France to be furnished by American companies.—**Page 76.**

Air Hygiene Foundation opens campaign to reduce sick absenteeism in heavy industries.—**Page 77.**

Allegheny Ludlum Steel Corp. reports 1939 sales at $37,332,141.—**Page 77.**

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Warehouse Prices	109
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Plant Expansion & Equipment	112

MEETINGS

April 10 to 12—International Acetylene Association, annual convention, Milwaukee.

April 11 and 12—Galvanizers Committee of American Zinc Institute, annual spring meeting, Pittsburgh.

April 25 and 26—Concrete Reinforcing Steel Institute, 16th annual meeting, Hot Springs, Va.

May 6 to 10—American Foundrymen's Association, annual meeting and equipment exhibition, Chicago.

May 7 and 8—Society of Automotive Engineers, national production meeting, Hartford.

May 20 to 22—American Gear Manufacturers Association, annual meeting, Asheville, N. C.

May 23—American Iron and Steel Institute, annual meeting, New York.

Industries using more machinery help employment, E. M. Queeny says.—**Page 78.**

Morehead medal to be awarded to Otto C. Voss, of the Allis-Chalmers Mfg. Co.—**Page 78.**

Iron ore produced in Michigan in 1939 totals 9,116,930 tons.—**Page 79.**

Republic Steel to build pilot plant for iron ore treatment.—**Page 79.**

Gear makers complete meeting program.—**Page 79.**

Carnegie-Illinois Steel Corp. will not abandon Farrell tin mills, J. L. Perry says.—**Page 79.**

Canadian business continues to expand as more war orders are placed.—**Page 81.**

Canadian pig iron and steel production fell off in February.—**Page 82.**

Babcock & Wilcox Tube Co. employees reject SWOC by vote of 1008 to 809.—**Page 82.**

Steel union organizer, Dies witness, cited for contempt.—**Page 85.**

New bids on Hangars sought.—**Page 85.**

New York members of American Welding Society inspect new Airlines Terminal, a welded structural job.—**Page 86.**

Atlas Forge Plant operates despite fire.—**Page 87.**

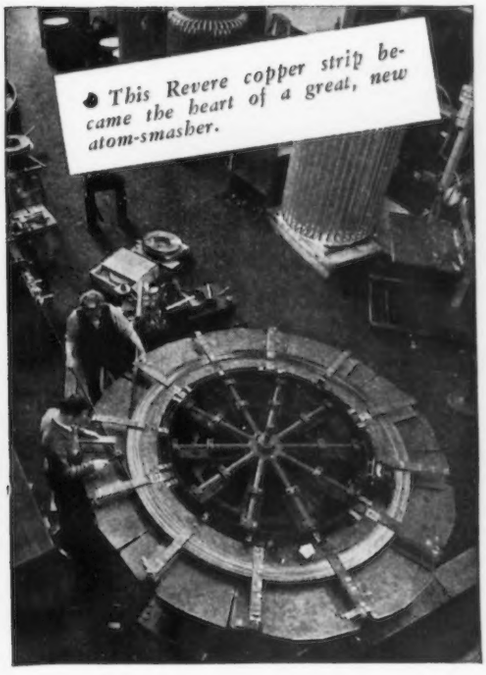
Steel earnings in 1939 are 4.2 per cent of invested capital; taxes exceed net income by $8,000,000.—**Page 90.**

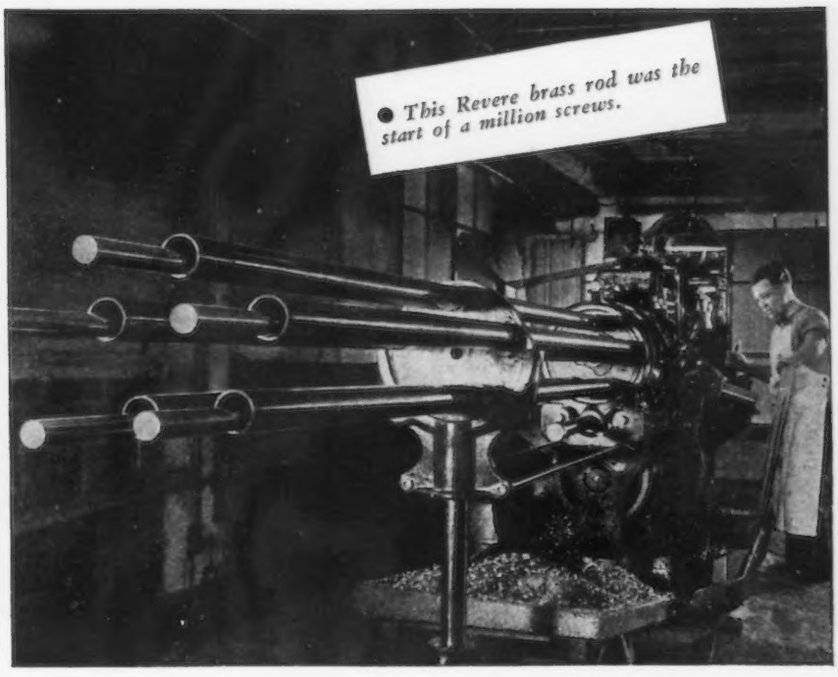
Iron and steel scrap exports in February 234,716 tons, compared with 187,457 tons in January.—**Page 91.**

Metal trades activity in Milwaukee area declines slightly.—**Page 91.**

Steel exports from U. S. in February rise 40,521 tons to total of 436,585 tons.—**Page 94.**

Plans for organization of a non-profit foundation to do research work in the interest of private business has been announced.—**Page 110.**





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Steel Earnings in 1939 are 4.2 Per Cent of Invested Capital, Taxes Exceed Net Income by $8,000,000

By W. A. PHAIR
Associate Editor, The Iron Age

o o o

THE year 1939 in the steel business was a profitable one—for the Federal and state governments. They received tax dividends in excess of $137,000,000, or over $2,600,000 a week, while those men who invested their money in the business and developed it into one of the largest in the country, received only $129,000,000, or $8,000,000 less than the Government. The dividends received by the super-preferred stockholder, the Government, were net, but out of the portion received by the owners of the business must be deducted sums to be set aside for such disastrous years as 1938 when the industry lost close to $10,000,000.

Taxes paid in 1939 by the companies covered by the analysis were equal to $2.84 for every ton of ingots produced and represented $284 for each employee. The tax burden per common share was $4.

Despite the magnitude of the tax burden borne by the industry, the financial results of 1939's operations were more favorable than in 1938, as the tabulation on the adjoining page indicates. Net profit for the 23 integrated companies covered by the tabulation amounted to $129,330,569, or 5.4 per cent of total sales. This compares with a loss of $9,869,556, or 0.7 per cent of sales in 1938. Income before interest on funded debt was equal to 4.2 per cent of invested capital, as against 0.6 per cent in 1938 and 6.1 per cent in 1937.

After allowances for preferred dividends, common share earnings were $2.37 per share in 1939, as compared with a loss of $1.69 per share in 1938. Despite the general improvement in earnings in 1939, four companies were unable to earn their preferred dividend requirements.

Assets at the close of the year were $4,383,532,000, a gain of $171,551,000 over 1938. Funded debt also showed an increase, but retirement of portions of certain preferred issues resulted in a reduction of about $6 million in preferred stock outstanding. The value of common shares outstanding was also below the previous year, while combined surplus rose close to $64 million.

Total invested capital at the end of the year was near the $4-billion dollar mark, the actual figure being $3,925,718,000. Interest payments on funded debt were $35½ million, which, added to net income, gave a return on invested capital of $169,908,855, or 4.2 per cent.

Preferred share dividend requirements amounted to $48,026,900, with $42,309,799 being actually disbursed to shareholders. Common share dividends paid in 1939 totaled $19,254,774, or almost double the previous year's disbursement.

The question of an exact definition of funded debt arose in several instances in the course of preparing the analysis. In all such instances, the opinion of competent accounting authorities was followed.

All data given pertaining to either production or capacity are expressed on a net ton basis for both 1938 and 1939. In a number of instances restatement of 1938's results by the companies necessitated revisions in figures published a year ago. Consequently, the data given for 1938 in the adjoining report are not comparable in all cases with data given a year ago.

From an earnings, as well as a production, viewpoint 1939 was a year of sharp contrasts. Operations in the first three quarters of the year were generally at a loss, but from September on, production rose to capacity levels and practically all the profit shown for the year was realized in the last three months. For many plants, it was the first time that an opportunity was provided for the utilization of all available capacity.

The last quarter, however, did not provide the industry with an adequate opportunity to demonstrate its full earning capabilities, for the suddenness of the upswing caught many producers with low stocks and banked furnaces. The effort to fill all orders placed during the buying wave caused certain uneconomical practices and obsolete equipment to be utilized. This undoubtly restricted the period's earnings.

A division between special steel producers and producers who, while turning out some tonnage of special steels, concentrate the bulk of their production on regular carbon steels, was again made in the analysis to emphasize the difference in the financial setup of the two types of producers.

An important point to be kept in mind when making comparisons of earnings in the adjoining compilation is that several companies still operate on a fiscal year ending other than Dec. 31. Consequently the results of these companies' earnings do not reflect the experience of the fall upswing.

Additional copies of the tabulation on the adjoining page may be obtained by writing THE IRON AGE.

Condensed Financial Statement of the Steel Industry for 1937, '38 and '39

	1939	1938	1937
Ingot production (% cap'y)	64.8	39.6	70.7
Sales (millions)	$2,342	$1,588	$2,756
Net Income (millions)	$129	$9*	$212
Profit margin (%)	5.4	0.7*	7.6
Earnings per common share	$2.37	$1.69*	$5.11
Earnings per ton ingot capacity	$1.74	$0.13*	$3.24
Assets (millions)	$4,383	$4,211	$4,431
Capital Invested (millions)	$3,925	$3,861	$3,988
Return on investment (%)	4.2	0.6	6.1
Capitalization per ton ingot capacity	$52.96†	$51.92†	$60.90††
Common shares outstanding (thousands)	34,268	34,389	32,342

* Loss. † Net ton. †† Gross ton.

FINANCIAL ANALYSIS OF THE STEE

NAME OF COMPANY		Ingot Capacity Net Tons	Ingot Production Net Tons	Operating Rate	Net Sales	Net Income	Profit Margin	Common Shares Outstanding	Common Share Earnings	Earning Per Ton Ingot Capaci
GROUP 1										
United States Steel Corp.	1939	27,795,000	17,625,676	63.4%	$801,039,242	$41,119,934	5.1%	8,703,252	$1.83	$1.48
	1938	28,885,000	10,525,056	36.4	560,508,303	7,717,454	1.4	8,703,252	3.78	0.27
Bethlehem Steel Corp.	1939	11,468,800	7,958,636	69.4	414,141,087	24,638,384	5.9	2,984,994	5.75	2.15
	1938	11,247,040	4,872,637	43.3	271,192,675	5,250,239	1.9	3,183,984	0.70	0.46
Republic Steel Corp.	1939	7,840,000	4,817,867	61.5	230,340,805	10,671,343	4.6	5,833,066	1.42	1.36
	1938	7,280,000	2,761,409	37.9	140,879,763	7,997,825	5.6	5,832,856	1.78	1.10
Jones & Laughlin Steel Corp.	1939	3,943,744	2,443,064	61.9	113,323,602	3,188,944	2.8	576,320	1.60	0.81
	1938	4,111,744	1,521,661	37.0	75,410,901	5,879,958	7.8	576,320	17.34	1.43
National Steel Corp.	1939	3,808,000	.....	....	132,061,908	12,581,636	9.5	2,202,167	5.71	3.30
	1938	3,808,000	.....	....	89,503,232	6,661,652	7.4	2,198,767	3.03	1.75
Youngstown Sheet & Tube Co.	1939	3,494,400	2,250,394	64.4	117,027,997	5,004,484	4.3	1,675,008	2.50	1.43
	1938	3,494,400	1,327,872	38.0	84,664,566	658,934	0.8	1,675,008	0.89	0.19
Inland Steel Co.	1939	3,091,200	2,408,045	77.9	115,346,665	10,931,016	9.5	1,624,265	6.73	3.54
	1938	3,091,200	1,669,248	54.0	74,058,924	4,916,203	6.6	1,577,005	3.12	1.59
American Rolling Mill Co.	1939	3,030,182	1,960,528	64.7	95,351,230	4,011,909	4.2	2,869,560	0.69	1.32
	1938	2,962,982	1,167,415	39.4	70,441,606	1,307,880	1.9	2,869,560	1.16	0.44
Wheeling Steel Corp.	1939	1,966,000	1,465,987	74.8	85,716,689	5,560,753	6.5	569,617	6.40	2.84
	1938	1,960,000	1,030,350	52.6	62,420,280	493,138	0.8	563,295	2.55	0.25
Colorado Fuel & Iron Corp.[2]	1939	1,108,800	471,240	42.5	22,095,139	57,564	0.3	563,620	0.10	0.05
	1938	1,108,800	424,670	38.3	20,118,984	829,363	4.1	563,620	1.47	0.75
Pittsburgh Steel Co.	1939	1,072,557	693,944	64.7	28,570,638	564,870	2.0	504,292	0.60	0.53
	1938	906,461	424,480	46.8	20,827,882	778,509	3.7	499,442	3.30	0.86
Otis Steel Co.	1939	976,640	.....	....	24,500,022	214,965	0.8	915,909	0.59	0.22
	1938	976,640	.....	....	13,718,500	1,230,297	9.0	915,751	2.17	1.26
Lukens Steel Co.[3]	1939	714,336	.....	....	11,929,582	83,127	0.7	317,976	0.26	0.12
	1938	714,336	.....	....	11,597,016	288,505	2.5	317,976	0.91	0.40
Sharon Steel Corp.	1939	560,000	442,400	79.0	16,178,598	255,497	1.6	392,331	0.11	0.46
	1938	560,000	280,000	50.0	10,505,879	95,325	0.9	391,611	1.01	0.17
Granite City Steel Co.	1939	403,200	.....	....	10,212,477	347,940	2.9	382,488	0.91	0.86
	1938	403,200	.....	....	6,359,472	330,231	5.2	382,488	0.86	0.82
Continental Steel Corp.	1939	364,000	.....	....	18,559,294	1,208,200	6.5	200,561	5.28	3.32
	1938	364,000	.....	....	12,801,105	632,865	4.9	200,561	2.32	1.74
Laclede Steel Co.	1939	295,355	.....	....	.....	210,053	....	206,250	1.02	0.71
	1938	278,840	.....	....	.....	331,849	....	206,250	1.61	1.19
Keystone Steel & Wire Co.[2]	1939	264,578	235,219	88.9	11,040,320	897,299	8.1	757,632	1.18	3.39
	1938	264,580	174,494	66.0	9,648,839	727,543	7.5	757,632	0.96	2.75
Summary, Group 1	1939	72,190,792	42,773,000	65.1[4]	2,247,435,295[5]	121,547,918	5.4[6]	31,279,308	2.41[7]	1.68
GROUP 2										
Crucible Steel Co. of America	1939	933,408	510,608[8]	54.7[8]	47,967,538	2,803,596	5.8	445,198	4.79	3.00
	1938	933,408	.....	....	29,125,598	2,237,026	7.7	445,198	8.78	2.40
Allegheny Ludlum Steel Corp.	1939	602,000	239,100	39.7	37,332,141	2,093,518	5.6	1,256,722	1.48	3.48
	1938	602,018	144,900	25.1[9]	18,261,231	1,070,186	5.9	1,256,722	1.04	1.85
Midvale Co.	1939	305,782	.....	....	.....	1,703,771	....	200,000	8.52	5.57
	1938	305,787	.....	....	.....	1,244,210	....	200,000	6.22	4.07
Rustless Iron & Steel Corp.	1939	50,400	.....	....	6,388,496	1,090,876	17.1	886,216	1.13	21.64
	1938	50,400	.....	....	2,348,298	81,110	3.5	871,721	0.12	1.61
Vanadium-Alloys Steel Co.[2]	1939	44,800	.....	....	2,822,291	90,890	3.2	200,232	0.45	2.03
	1938	44,800	.....	....	3,540,535	213,128	6.0	200,367	1.06	4.76
Summary, Group 2	1939	1,936,390	749,708	48.8[4]	94,510,466[5]	7,782,651	6.4[6]	2,988,368	1.94[7]	4.02
Summary, All Producers	1939	74,127,182	43,522,708	64.8%[4]	$2,341,945,761[10]	$129,330,569	5.4%[6]	34,267,676	$2.37[7]	$1.74
	1938	74,353,636	26,324,192	39.6%[4]	$1,587,933,589[10]	$9,869,556	0.7%[6]	34,389,386	$1.69[7]	$0.13

1—Net income before dividends and interest on funded debt. 2—Fiscal year ends June 30. 3—Fiscal year ends Oct. 15. 4—Based only on companies reporting production. 5—One company did not report net sales. 6—Based on companies reporting both sales and net income. 7—After preferred dividend requirements. 8—Shipments. 9—Based on that portion of Ludlum's capacity available to the Allegheny Ludlum Steel Corp. after Aug. 16, the dat Co. and Allegheny Steel Co. 10—

S OF THE STEEL INDUSTR

	Net Income	Profit Margin	Common Shares Outstanding	Common Share Earnings	Earnings Per Ton of Ingot Capacity	Earnings Per Ton of Ingots Produced	Total Assets (000 omitted)	Funded Debt (000 omitted)
,242	$41,119,934	5.1%	8,703,252	$1.83	$1.48	$2.33	$1,768,524	$246,062
,303	7,717,454	1.4	8,703,252	3.78	0.27	0.73	1,711,279	243,712
,087	24,638,384	5.9	2,984,994	5.75	2.15	3.10	732,932	191,058
,675	5,250,239	1.9	3,183,984	0.70	0.46	1.08	699,474	175,127
,805	10,671,343	4.6	5,833,066	1.42	1.36	2.21	365,050	87,528
,763	7,997,825	5.6	5,832,856	1.78	1.10	2.90	348,716	89,082
,602	3,188,944	2.8	576,320	1.60	0.81	1.31	230,865	46,697
,901	5,879,958	7.8	576,320	17.34	1.43	3.86	227,654	49,959
,908	12,581,636	9.5	2,202,167	5.71	3.30	....	218,028	65,604
,232	6,661,652	7.4	2,198,767	3.03	1.75	....	207,145	62,747
,997	5,004,484	4.3	1,675,008	2.50	1.43	2.22	247,655	85,500
,566	658,934	0.8	1,675,008	0.89	0.19	0.50	241,720	87,000
,665	10,931,016	9.5	1,624,265	6.73	3.54	4.54	166,812	51,800
,924	4,916,203	6.6	1,577,005	3.12	1.59	2.95	156,507	52,900
,230	4,011,909	4.2	2,869,560	0.69	1.32	2.05	144,317	2,000
,606	1,307,880	1.9	2,869,560	1.16	0.44	1.12	138,850	2,000
,689	5,560,753	6.5	569,617	6.40	2.84	3.79	124,021	32,200
,280	493,138	0.8	563,295	2.55	0.25	0.48	118,137	32,900
,139	57,564	0.3	563,620	0.10	0.05	0.12	39,747	15,518
,984	829,363	4.1	563,620	1.47	0.75	1.95	39,371	15,518
,638	564,870	2.0	504,292	0.60	0.53	0.81	45,794	5,233
,882	778,509	3.7	499,442	3.30	0.86	1.83	44,271	5,725
,022	214,965	0.8	915,909	0.59	0.22	....	37,543	14,080
,500	1,230,297	9.0	915,751	2.17	1.26	....	36,813	14,394
,582	83,127	0.7	317,976	0.26	0.12	....	13,900	3,826
,016	288,505	2.5	317,976	0.91	0.40	....	13,291	3,826
,598	255,497	1.6	392,331	0.11	0.46	0.58	18,574	None
,879	95,325	0.9	391,611	1.01	0.17	0.34	18,400	None
,477	347,940	2.9	382,488	0.91	0.86	....	16,946	4,000
,472	330,231	5.2	382,488	0.86	0.82	....	14,346	1,300
,294	1,208,200	6.5	200,561	5.28	3.32	....	15,900	2,000
,105	632,865	4.9	200,561	2.32	1.74	....	15,009	1,267
.....	210,053	....	206,250	1.02	0.71	....	7,259	750
.....	331,849	....	206,250	1.61	1.19	....	7,204	750
,320	897,299	8.1	757,632	1.18	3.39	3.81	10,354	1,400
,839	727,543	7.5	757,632	0.96	2.75	4.17	10,202	1,600
,295[5]	121,547,918	5.4[6]	31,279,308	2.41[7]	1.68	2.43[4]	4,204,221	855,256
,538	2,803,596	5.8	445,198	4.79	3.00	5.49[8]	115,334	11,500
,598	2,237,026	7.7	445,198	8.78	2.40	....	109,277	11,750
,141	2,093,518	5.6	1,256,722	1.48	3.48	8.76	33,638	None
,231	1,070,186	5.9	1,256,722	1.04	1.85[9]	7.39	29,845	None
.....	1,703,771	....	200,000	8.52	5.57	....	17,592	None
.....	1,244,210	....	200,000	6.22	4.07	....	14,766	None
,496	1,090,876	17.1	886,216	1.13	21.64	....	6,763	1,750
,298	81,110	3.5	871,721	0.12	1.61	....	3,687	None
,291	90,890	3.2	200,232	0.45	2.03	....	5,984	None
,535	213,128	6.0	200,367	1.06	4.76	....	6,017	None
,466[5]	7,782,651	6.4[6]	2,988,368	1.94[7]	4.02	....	179,311	13,250
,761[10]	$129,330,569	5.4%[6]	34,267,676	$2.37[7]	$1.74	$2.50[4]	$4,383,532	$868,506
,589[10]	$9,869,556	0.7%[6]	34,389,386	$1.69[7]	$0.13	$0.57[4]	$4,211,981	$851,557

es reporting both sales and net income. requirements. 8—Shipments. 9—Based on pacity available to the Allegheny Ludlum Steel Corp. after Aug. 16, the date of the merger of the Ludlum Steel Co. and Allegheny Steel Co. 10—Two companies did not report sales.

STRY—1939

Data cover the operations of 23 integrate
capacity of the United States. All values ar

Funded Debt (000 omitted)	Preferred Stock (000 omitted)	Common Stock (000 omitted)	Combined Surplus (000 omitted)	Total Investment (000 omitted)	Earnings on Investment[1]	Return on Invest-ment	Invest-ment Per Ton of Ingot Capacity	
$246,062	$360,281	$652,744	$301,782	$1,560,869	$50,432,865	3.2%	$56.16	$2
243,712	360,281	652,744	285,882	1,542,619	544,874	0.04	53.41	2
191,058	112,066	283,575	78,229	664,928	31,742,436	4.8	57.98	
175,127	112,066	302,479	64,863	654,535	12,025,116	1.8	58.20	
87,528	40,190	132,520	66,387	326,625	15,038,721	4.6	41.66	
89,082	40,190	132,517	58,711	320,500	3,413,162	1.1	44.02	
46,697	58,714	57,632	48,380	211,423	5,428,000	3.9	53.61	
49,959	58,714	57,632	45,290	211,595	3,821,747	1.8	51.46	
65,604	None	55,054	76,146	196,804	14,992,546	7.6	51.68	
62,747	None	54,969	71,390	189,106	9,046,577	4.8	49.66	
85,500	15,000	105,074	24,023	229,597	8,720,763	3.8	65.70	
87,000	15,000	105,057	20,819	227,876	2,202,184	1.0	65.21	
51,800	None	60,537	38,516	150,853	12,770,570	8.5	48.80	
52,900	None	57,465	34,098	144,463	6,788,710	4.7	46.73	
2,000	45,000	71,739	10,397	129,136	4,177,860	3.2	42.62	
2,000	45,000	71,739	10,193	128,932	1,127,516	0.9	43.45	
32,200	37,933	28,603	15,445	114,181	7,041,646	6.2	58.26	
32,900	38,024	28,287	10,753	109,964	2,006,160	1.8	56.10	
15,518	None	5,636	13,382	34,536	836,506	2.4	31.15	
15,518	None	5,636	13,309	34,463	51,205	0.2	31.08	
5,233	15,471	4,816	14,729	40,249	945,371	2.3	37.53	
5,725	15,475	4,767	14,142	40,109	370,912	0.9	44.24	
14,080	10,298	4,579	5,285	34,242	879,215	2.6	35.06	
14,394	10,314	4,579	5,245	34,532	557,785	1.6	35.36	
3,826	None	3,180	3,637	10,643	294,512	2.8	14.90	
3,826	None	3,180	3,553	10,559	80,514	0.8	14.78	
None	5,972	3,975	5,595	15,542	255,497	1.6	27.75	
None	5,972	3,967	5,638	15,577	95,325	0.6	27.81	
4,000	None	8,484	3,320	15,804	519,427	3.3	39.20	
1,300	None	8,484	3,020	12,804	265,836	2.1	31.75	
2,000	1,885	5,276	4,778	13,939	1,273,193	9.1	38.29	
1,267	2,391	5,276	4,221	13,155	697,307	5.3	36.14	
750	None	4,125	1,796	6,671	210,053	3.1	22.59	
750	None	4,125	1,792	6,667	331,849	5.0	23.91	
1,400	None	3,157	4,864	9,421	961,633	10.2	35.61	
1,600	None	3,157	4,757	9,514	797,650	8.4	35.96	
855,256	702,810	1,490,706	716,691	3,765,463	156,520,814	4.1	52.16	4
11,500	23,880	44,520	28,915	108,815	3,389,600	3.1	116.57	
11,750	23,880	44,520	26,111	106,261	1,792,219	1.7	113.84	
None	3,343	7,854	15,911	27,108	2,093,518	7.7	45.03	
None	3,343	7,854	14,820	26,017	1,070,186	4.1	45.02[9]	
None	None	10,574	2,299	12,873	1,703,771	13.2	42.10	
None	None	10,574	1,791	12,365	1,244,210	10.1	40.44	
1,750	1,189	885	1,875	5,699	1,110,262	19.5	113.08	
None	1,189	871	1,109	3,169	81,110	2.6	62.87	
None	None	1,424	4,336	5,760	90,890	1.6	128.58	
None	None	1,422	4,297	5,719	213,128	3.7	127.66	
13,250	28,412	65,257	53,336	160,255	8,388,041	5.2	82.76	
$868,506	$731,222	$1,555,963	$770,027	$3,925,718	$164,908,855	4.2%	$52.96	$4
$851,557	$731,839	$1,571,301	$705,804	$3,860,501	$23,332,468	0.6%	$51.92	$4

EL INDUSTRY—1939

Data cover the operations capacity of the United State

nings Ton of got acity	Earnings Per Ton of Ingots Produced	Total Assets (000 omitted)	Funded Debt (000 omitted)	Preferred Stock (000 omitted)	Common Stock (000 omitted)	Combined Surplus (000 omitted)	Total Investment (000 omitted)	Earnings on Investment[1]	Retur Inve me
48	$2.33	$1,768,524	$246,062	$360,281	$652,744	$301,782	$1,560,869	$50,432,865	3
27	0.73	1, 279	243,712	360,281	652,744	285,882	1,542,619	544,874	0
15	3.10	7..,32	191,058	112,066	283,575	78,229	664,928	31,742,436	4
46	1.08	699,474	175,127	112,066	302,479	64,863	654,535	12,025,116	1
36	2.21	365,050	87,528	40,190	132,520	66,387	326,625	15,038,721	4
10	2.90	348,716	89,082	40,190	132,517	58,711	320,500	3,413,162	1
81	1.31	230,865	46,697	58,714	57,632	48,380	211,423	5,428,000	3
43	3.86	227,654	49,959	58,714	57,632	45,290	211,595	3,821,747	1
30	....	218,028	65,604	None	55,054	76,146	196,804	14,992,546	7
75	....	207,145	62,747	None	54,969	71,390	189,106	9,046,577	4
43	2.22	247,655	85,500	15,000	105,074	24,023	229,597	8,720,763	3
19	0.50	241,720	87,000	15,000	105,057	20,819	227,876	2,202,184	1
54	4.54	166,812	51,800	None	60,537	38,516	150,853	12,770,570	8
59	2.95	156,507	52,900	None	57,465	34,098	144,463	6,788,710	4
32	2.05	144,317	2,000	45,000	71,739	10,397	129,136	4,177,860	3
44	1.12	138,850	2,000	45,000	71,739	10,193	128,932	1,127,516	0
84	3.79	124,021	32,200	37,933	28,603	15,445	114,181	7,041,646	6
25	0.48	118,137	32,900	38,024	28,287	10,753	109,964	2,006,160	1
05	0.12	39,747	15,518	None	5,636	13,382	34,536	836,506	2
75	1.95	39,371	15,518	None	5,636	13,309	34,463	51,205	0
53	0.81	45,794	5,233	15,471	4,816	14,729	40,249	945,371	2
86	1.83	44,271	5,725	15,475	4,767	14,142	40,109	370,912	0
22	....	37,543	14,080	10,298	4,579	5,285	34,242	879,215	2
26	....	36,813	14,394	10,314	4,579	5,245	34,532	557,785	1
12	....	13,900	3,826	None	3,180	3,637	10,643	294,512	2
40	....	13,291	3,826	None	3,180	3,553	10,559	80,514	0
46	0.58	18,574	None	5,972	3,975	5,595	15,542	255,497	1
17	0.34	18,400	None	5,972	3,967	5,638	15,577	95,325	0
86	....	16,946	4,000	None	8,484	3,320	15,804	519,427	3
82	....	14,346	1,300	None	8,484	3,020	12,804	265,836	2
32	....	15,900	2,000	1,885	5,276	4,778	13,939	1,273,193	9
74	....	15,009	1,267	2,391	5,276	4,221	13,155	697,307	5
71	....	7,259	750	None	4,125	1,796	6,671	210,053	3
19	....	7,204	750	None	4,125	1,792	6,667	331,849	5
39	3.81	10,354	1,400	None	3,157	4,864	9,421	961,633	10
75	4.17	10,202	1,600	None	3,157	4,757	9,514	797,650	8
68	2.43[4]	4,204,221	855,256	702,810	1,490,706	716,691	3,765,463	156,520,814	4
00	5.49[8]	115,334	11,500	23,880	44,520	28,915	108,815	3,389,600	3
40	....	109,277	11,750	23,880	44,520	26,111	106,261	1,792,219	1
48	8.76	33,638	None	3,343	7,854	15,911	27,108	2,093,518	7
85[9]	7.39	29,845	None	3,343	7,854	14,820	26,017	1,070,186	4
57	....	17,592	None	None	10,574	2,299	12,873	1,703,771	13
07	....	14,766	None	None	10,574	1,791	12,365	1,244,210	10
64	....	6,763	1,750	1,189	885	1,875	5,699	1,110,262	19
61	....	3,687	None	1,189	871	1,109	3,169	81,110	2
03	....	5,984	None	None	1,424	4,336	5,760	90,890	1
76	....	6,017	None	None	1,422	4,297	5,719	213,128	3
02	....	179,311	13,250	28,412	65,257	53,336	160,255	8,388,041	5
74	$2.50[4]	$4,383,532	$868,506	$731,222	$1,555,963	$770,027	$3,925,718	$164,908,855	4
3	$0.57[4]	$4,211,981	$851,557	$731,839	$1,571,301	$705,804	$3,860,501	$23,332,468	0

te of the merger of the Ludlum Steel
—Two companies did not report sales.

ations of 23 integrated steel companies, representing 91 per cent of the ingot d States. All values are as of Dec. 31, unless otherwise noted. Red indicates loss.

Return on Investment	Investment Per Ton of Ingot Capacity	Preferred Share Requirements	Preferred Dividends Paid	Common Dividends Paid		NAME OF COMPANY
						GROUP 1
3.2%	$56.16	$25,219,677	$25,219,677	None	1939	United States Steel Corp.
0.04	53.41	25,219,677	25,219,677	None	1938	
4.8	57.98	7,471,096	7,471,096	$4,775,076	1939	Bethlehem Steel Corp.
1.8	58.20	7,471,096	7,471,096	None	1938	
4.6	41.66	2,411,403	3,861,164	None	1939	Republic Steel Corp.
1.1	44.02	2,411,403	423,455	None	1938	
3.9	53.61	4,109,973	None	None	1939	Jones & Laughlin Steel Corp.
1.8	51.46	4,109,973	None	None	1938	
7.6	51.68	None	None	3,738,384	1939	National Steel Corp.
4.8	49.66	None	None	2,168,532	1938	
3.8	65.70	825,000	825,000	None	1939	Youngstown Sheet & Tube Co.
1.0	65.21	825,000	825,000	None	1938	
8.5	48.80	None	None	6,473,633	1939	Inland Steel Co.
4.7	46.73	None	None	3,940,693	1938	
3.2	42.62	2,025,000	1,800,000	None	1939	American Rolling Mill Co.
0.9	43.45	2,025,000	1,012,523	None	1938	
6.2	58.26	1,912,959	2,360,913	None	1939	Wheeling Steel Corp.
1.8	56.10	1,929,449	1,317,732	None	1938	
2.4	31.15	None	None	None	1939	Colorado Fuel & Iron Corp.[2]
0.2	31.08	None	None	None	1938	
2.3	37.53	869,162	None	None	1939	Pittsburgh Steel Co.
0.9	44.24	869,382	None	None	1938	
2.6	35.06	755,183	None	None	1939	Otis Steel Co.
1.6	35.36	755,354	397,218	None	1938	
2.8	14.90	None	None	None	1939	Lukens Steel Co.[3]
0.8	14.78	None	None	None	1938	
1.6	27.75	298,600	298,600	None	1939	Sharon Steel Corp.
0.6	27.81	298,600	298,600	None	1938	
3.3	39.20	None	None	47,814	1939	Granite City Steel Co.
2.1	31.75	None	None	47,808	1938	
9.1	38.29	131,985	148,418	401,122	1939	Continental Steel Corp.
5.3	36.14	168,121	168,121	200,561	1938	
3.1	22.59	None	None	206,250	1939	Laclede Steel Co.
5.0	23.91	None	None	257,813	1938	
10.2	35.61	None	None	416,698	1939	Keystone Steel & Wire Co.[2]
8.4	35.96	None	None	719,750	1938	
4.1	52.16	46,030,038	41,984,868	17,058,977	1939	Summary, Group 1
						GROUP 2
3.1	116.57	1,671,600	None	None	1939	Crucible Steel Co. of America
1.7	113.84	1,671,600	417,900	None	1938	
7.7	45.03	233,982	233,639	625,737	1939	Allegheny Ludlum Steel Corp.
4.1	45.02[9]	233,982	233,480	None	1938	
13.2	42.10	None	None	1,298,414	1939	Midvale Co.
10.1	40.44	None	None	998,720	1938	
19.5	113.08	91,280	91,292	221,562	1939	Rustless Iron & Steel Corp.
2.6	62.87	91,292	91,292	None	1938	
1.6	128.58	None	None	50,084	1939	Vanadium-Alloys Steel Co.[2]
3.7	127.66	None	None	392,848	1938	
5.2	82.76	1,996,862	324,931	2,195,797	1939	Summary, Group 2
4.2%	$52.96	$48,026,900	$42,309,799	$19,254,774	1939	Summary, All Producers
0.6%	$51.92	$48,079,929	$37,876,094	$8,726,725	1938	



. . . OBITUARY . . .

HOWARD B. LOXTERMAN, aged 57, vice-president and director, Blaw-Knox Co., Pittsburgh, died March 28 at his home in Pittsburgh.

Mr. Loxterman was connected with Blaw-Knox Co. since its formation 34 years ago when he was a draftsman. He soon was put in charge of design and fabrication of steel forms, later becoming manager of service. His next appointment was as sales manager of the company's Blaw-Knox division and in 1934 he was elected secretary and a director, and, later in that same year, vice-president.

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DENTON K. SWARTWOUT, chairman of the board of Swartwout Co., Cleveland manufacturer of industrial ventilating and power plant equipment, died March 22. Mr. Swartwout founded the company in 1901 and was its president until 1936 when he was succeeded by his son, Denton K. Swartwout, Jr. Mr. Swartwout was a past president of the American Supply and Machinery Manufacturers Association. He was 78 years old.

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PETER J. HERKNER, 58, superintendent of Breckenridge Engineering Co., Cleveland, died March 26, two days after returning from a Florida vacation. Prior to joining the Breckenridge company, he was for 35 years an engineer with Warner & Swasey Co., Cleveland.

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FRANK ARMOUR, retired construction superintendent for Van Dorn Iron Works Co., and formerly bridge maintenance superintendent for Erie Railroad, died in Cleveland, March 27, aged 66 years.

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WILLIAM W. LEOPOLD, general superintendent of the Superior Sheet Steel Co., Division of Continental Steel Corp., died March 26, in the South Side Hospital, Youngstown, from injuries suffered a few hours earlier in an automobile accident. He was 38 years old. He was a native of Canton, Ohio, and started as a heater's helper with the Superior Sheet Steel Co. when it began operations in 1920. In 1939 he was appointed general superintendent in charge of production.

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J. E. HUGHES, who had been identified with the Aetna-Standard Engineering Co., Youngstown, since 1931 in a sales engineering capacity, died after a short illness on March 19, aged 46 years. He was formerly associated with the Woodard Engineering Co. and the Youngstown Sheet & Tube Co.

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GUY S. WARREN, former president and general manager of William H. Keller, Inc., maker of pneumatic tools at Grand Haven, Mich., was buried March 25 at Louisville, Ky., his birthplace. He was 54 years old. Mr. Warren retired a year ago because of ill health and died in University Hospital, Ann Arbor, where he had been a patient for two weeks.

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JOHN EDWARD COLLIS, a pioneer in manufacturing automobile bodies, died March 27 in a hospital at Pontiac, Mich., after a month's illness. He was 63 years old. Mr. Collis worked in the C. R. Wilson Body plant when Henry Ford was experimenting on automobiles during 1902.



HOWARD B. LOXTERMAN, late vice-president and director of the Blaw-Knox Co.

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FRED W. WAGNER, chief chemist at the coke plant of Jones & Laughlin Steel Corp., Pittsburgh, died in that city on March 26. Mr. Wagner was a graduate of Penn State College. He was 46 years old.

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JAMES CRISWELL, aged 81, president of the James Criswell Engineering Co., Pittsburgh, died March 23 at his home in Pittsburgh. Mr. Criswell was general superintendent of the S. R. Smythe Co. for 40 years before organizing his own firm in 1927.

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ALEXANDER GIBSON, who has been identified since 1929 with the sales staff of the Cleveland office of the Brown & Sharpe Mfg. Co., Providence,, died suddenly in Cincinnati on March 20, aged 41 years.

February Scrap Exports Valued at $4,137,635

EXPORTS of scrap from the United States in February totaled 234,716 tons, valued at $4,137,635, preliminary figures released by the Metals and Minerals Division of the Bureau of Foreign and Domestic Commerce indicate. These figures represent sharp gains over the 187,457-ton, $3,567,221 trade of January and also top the 224,913-ton, $3,345,344 trade of February, 1939.

Cumulative shipments covering the first two months of the year—422,173 tons—are well under the 452,792-ton total registered in the comparable period of 1939. By value, however, the 1940 shipments exceed those of 1939 by a considerable margin—$7,704,856 against $6,696,695.

Included in the 234,716-ton February trade in scrap is 232,800 tons of iron and steel scrap, 419 tons of tin plate scrap, 314 tons of terneplate clippings, etc., 454 tons of tin plate circles, and 729 tons of waste-waste tin plate. Leading markets for the 232,800 tons of iron and steel scrap noted above were Japan, 101,200 tons; the United Kingdom, 56,162 tons, and Italy, 49,636 tons.

Metal Trades Slacken

MILWAUKEE—The metal trades industry showed a slight drop in average hours during February from the preceding month, according to a survey of 36 key plants. February indicated 40.2 average hours against 40.6 in January. Man hours and the number of employees also showed a slight decline from the previous month's level. The slowing up tendency is evident also in March. Machine shops had a better business than foundries, the survey revealed, a condition also noticeable in January.

. . . PERSONALS . . .

EDWARD J. CHARLTON, since 1931 design engineer, has been appointed general manager of Lukenweld, Inc., Coatesville, Pa. ROBERT L. BUNTING, who has been assistant shop superintendent since 1936, has been promoted to the superintendency, succeeding ROLAND J. WHITING, who has resigned. GEORGE L. SNYDER, who since 1937 has been assistant chief engineer, has been made chief engineer. D. BRUCE JOHNSTON, since 1935 engaged in experimental development and research work at Lukenweld, has been appointed manager of development and research. ROBERT B. NIVISON, heretofore night superintendent, has been made chief of inspection. Other appointments include: ROBERT C. SAHLIN, assistant manager of sales; S. NELSON BUELL, assistant chief engineer; FRED W. FORBES, assistant superintendent; W. J. MCALPINE, general foreman and GEORGE WHEATLEY, methods engineer.

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RALPH W. BAKER, who has been identified with Republic Steel Corp. since 1929 as research metallurgist and sales engineer, has been appointed assistant to the president of the Flood Co., Cleveland, maker of protective priming material. Mr. Baker was graduated from Lehigh University in chemical engineering and received a master's degree in metallurgy from Yale University. He is chairman of the Committee on Methods of Corrosion Testing of the American Society for Testing Materials.

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G. V. PARKINS has retired as president of McKeesport Tin Plate Corp., McKeesport, Pa. He had been head of the concern for 37 years and will continue in an advisory capacity, having been reelected to the directorate of the company.

J. P. FIFE, chairman of the board and a partner in the law firm of Douglass, Fife & Young, Pittsburgh, has been elected acting president. LEWIS M. STEVENS, a Philadelphia attorney, was added to the board of directors.

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DEWEY M. DOW has been promoted from works manager to vice-president in charge of production, for Air-Way Electric Appliance Corp., Toledo.

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L. M. CLEGG, senior vice-president of Thompson Products, Inc., Cleveland, has been elected executive vice-president.

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E. R. STETTINIUS, JR., chairman of the board, United States Steel Corp., will speak on the "Mutual Responsibilities of Business and the Public" before a meeting of the Economic Club of Chicago to be held at the Palmer House, April 11.

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J. W. DURLING, has been named general superintendent of the tool and die shop of the Ford Motor Co.

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PHILIP F. LA FOLLETTE, former Governor of Wisconsin and WILLIAM S. COVINGTON, son-in-law of CHARLES H. MORSE have been elected to the board of directors of Fairbanks, Morse & Co., Chicago, to succeed STERLING MORTON and GEORGE BUFFINGTON, who have resigned.

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YALE D. HILLS has been appointed assistant general manager of the service-sales division of the Timken Roller Bearing Co., Canton, Ohio. Mr. Hills went with the company in 1919 and has filled various positions in the general office and in the field. For the past nine years he has held managerial positions on the West Coast. Recently he returned to the general office at Canton as supervisor of distributers, which position he held until his present advancement.

J. F. CORNELL, branch manager of the Minneapolis branch of the service-sales division of the company, has become special representative, with headquarters at Canton. Mr. Cornell will







Left to right: EDWARD J. CHARLTON, new general manager of Lukenweld, Inc.; ROBERT L. BUNTING, superintendent; ment and research, and ROBERT B. NIVISON,

be replaced by J. P. ROBERTS, who has been connected with the Pittsburgh office as a salesman.

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ALLEN N. BENNETT, of Framingham, Mass., has been made treasurer of the Graton & Knight Co., Worcester, Mass.

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B. D. CLAFFEY, an executive of the General Malleable Corp., Waukesha, Wis., has been elected president of the Waukesha Association of Commerce.

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DON J. MURRAY, for the past three years district representative for wiring materials at Los Angeles for the General Electric Co., Schenectady, has been appointed sales manager for conduit products, with headquarters at Bridgeport, Conn. He has been identified with the company since 1928.

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CLYDE E. LOWE, who has been serving the Pittsburgh district in a sales capacity for the Swan-Finch Oil Co., has been appointed representative in the Pittsburgh area for the Cowles Detergent Co., Cleveland. He will work out of Pittsburgh in collaboration with the Apex Soap & Sanitary Co., McKees Rocks, which has been appointed Cowles distributer.

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JOHN V. JIRASEK, who has been engaged in research, experimental and development work in the petroleum industry, has joined the Worthington Pump & Machinery Corp., Harrison, N. J., as special representative to the petroleum and chemical industries.

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R. H. MUNN, JR., has been appointed Pittsburgh district representative for Ampco Metal, Inc., Milwaukee. He has made his headquarters in the Frick Building.

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JESSEL S. WHYTE, president of the Macwhyte Co., Kenosha, Wis., has been elected president of the Kenosha Manufacturers' Association.

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KENNETH K. BOWMAN, M. A. EDWARDS, and FRANCIS MOHLER were among those to receive recently Charles A. Coffin Foundation Awards of the General Electric Co., Schenectady, for their development of the Amplidyne generator.

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ELMER J. BURNES, formerly general sales agent for the Chateaugay Ore & Iron Co. for the past 11 years, is now associated with the New York office of Hickman, Williams & Co.

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EDWIN K. PRIEST, for the past several years president and general manager of the Floyd-Wells Stove Co., Royersford, Pa., has been appointed president and works manager of the Moore Corp., Joliet, Ill., succeeding MILO B. HOPKINS, who has become chairman of the board. Mr. Priest is also secretary-treasurer of the Institute of Cooking and Heating Appliance Manufacturers.

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S. B. APPLEBAUM, vice-president and secretary of the Permutit Co., New York, has been elected a director of the company. He has been identified with the company for more than 25 years.

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EDWARD J. SCHROETER, Cleveland Heights, Ohio, has been named president of the Huber Mfg. Co., Marion, Ohio, farm and road machinery concern. He succeeds A. W. NEWBY, president since 1929, who becomes vice-president and chairman of the board.

Republic Abandons Hand Sheet Mills

CLEVELAND—Both the Massillon and Niles hand sheet mills of Republic Steel Corp. have been "permanently discontinued," according to notices sent to employees recently. It is expected that most workers will be gradually supplied jobs elsewhere and in the meantime will be taken care of through unemployment insurance. The two plants will still be available for potential use if operations should rise to a level comparable to the fourth quarter of last year.





GEORGE L. SNYDER, chief engineer; D. BRUCE JOHNSTON, manager of development; ... chief of inspection.



RALPH W. BAKER, who has been appointed assistant to the president of the Flood Co.

February Steel Exports Top January Total by 40,521 Tons

AT 436,585 gross tons valued at $33,361,201, February exports of iron and steel products (excluding scrap) exceeded the high trade of January, 396,064 tons valued at $31,153,365, by 40,521 tons and $2,207,836, preliminary figures released by the Metals and Minerals Division of the Bureau of Foreign and Domestic Commerce reveal. In February, 1939, only 134,777 tons of these products, valued at $9,772,707, were exported—about one-third by both quantity and value of the February, 1940, trade.

Increased shipments to the United Kingdom, Sweden and Belgium were largely responsible for the sharp gain in the trade with Europe, with shipments totaling 146,447 tons against 109,957 tons in January.

A less spectacular gain was registered in the trade with South America, with shipments aggregating 119,639 tons against 110,657 tons in the preceding month. Exports to the Far East were virtually unchanged at 83,260 tons against 83,056 tons in January, the trade with Africa presenting a generally similar picture, with February shipments at 14,577 tons, in comparison with the January trade of 14,879 tons. The trade with North and Central America and the West Indies, however, was down to a total of 72,662 tons, against 77,515 tons in January.

By virtue of her large purchases of non-alloy steel ingots, billets, etc., the United Kingdom ranked first among the United States' export markets for iron and steel in February, her total of 68,130 tons representing a sharp gain over the 45,675 tons taken by this market in January. Argentina ranked second, with a trade of 43,281 tons against 37,735 tons in January; Canada was third, with 40,586 tons against 43,966 tons, while Brazil was fourth, with purchases of 30,547 tons against 24,113 tons.

In point of tonnage, non-alloy steel ingots, etc., was the leading item exported during February, the 60,643-ton total, including 54,321 tons sent to the United Kingdom and 6,619 tons sent to Japan. Outstanding among the large number of buyers of the 50,643 tons of tin plate exported were Brazil, 7,763 tons; Sweden, 5,842 tons; Argentina, 4,509 tons, and Switzerland, 4,287 tons.

Cumulative exports over the first two months of 1940, or 832,649 tons, valued at $54,514,566, are not only three times as great as in the comparable period of 1939, 269,565 tons valued at $19,987,254, but equal or exceed the shipments recorded for the entire calendar years of 1931, 1932 and 1933.

Iron and Steel Exports (In Gross Tons)	February		Two Months Ended February	
	1940	1939	1940	1939
Pig iron	18,927	4,524	33,984	10,849
Ferromanganese and spiegeleisen	5,069	9	5,477	9
Other ferroalloys	473	22	1,220	125
Scrap, iron and steel	232,800	222,704	418,453	448,138
Scrap, tin plate	873	1,351	1,648	2,990
Waste-waste tin plate & tinplate clippings	1,043	858	2,072	1,669
Pig iron, ferroalloys and scrap	*259,185*	*229,468*	*462,854*	*463,780*
Ingots, blooms, billets, sheet bars	65,794	10,140	123,988	23,506
Ingots, etc., alloy steel, incl. stainless	1,277	3,335	3,885	4,316
Skelp	3,388	637	11,923	1,379
Wire rods	14,417	360	23,712	713
Semi-finished steel	*84,876*	*14,472*	*163,508*	*29,914*
Bars, plain and reinforcing	47,940	8,959	92,822	19,641
Bars, alloy steel	1,325	1,144	2,925	2,496
Bars, stainless steel	58	4	138	15
Iron bars	2,176	54	3,625	115
Plates, plain and fabricated	38,780	21,041	62,845	32,057
Plates, alloy steel	383	70	556	108
Plates, stainless	9	6	13	9
Sheets, galvanized steel	15,286	5,433	31,287	12,759
Sheets, galvanized iron	889	335	1,873	764
Sheets, black, plain steel	38,142	19,886	68,711	44,154
Sheets, alloy steel	455	31	1,017	378
Sheets, stainless	151	41	392	93
Sheets, black iron	2,977	577	5,471	1,153
Hoops, bands, strips, plain steel	13,507	7,977	31,603	15,034
Hoops, bands, strip steel alloy	16	34	91	46
Hoops, bands, strip steel, stainless	36	45	136	201
Tin plate and taggers' tin	60,643	10,968	124,944	23,638
Terne plate (incl. long ternes)	399	221	1,026	379
Structural shapes, plain material	13,008	5,603	27,537	11,007
Structural material, fabricated	6,785	2,285	13,839	3,744
Sheet piling	13	546	1,984	713
Tanks, steel	1,535	374	3,492	1,816
Steel rails	11,898	4,750	17,727	7,929
Rail fastenings, switches, spikes, etc.	2,537	1,689	4,159	2,694
Boiler tubes	2,438	442	4,197	835
Casing and oil line pipe	20,405	5,330	39,426	9,593
Pipe, black and galvanized, welded steel	9,146	2,843	16,738	5,529
Pipe, black and galvanized, welded iron	1,126	529	2,270	1,224
Plain and galvanized wire	10,567	3,822	20,313	7,962
Barbed wire and woven wire products	2,310	2,278	5,409	5,007
Wire rope and other products	2,895	934	4,972	1,792
Nails and tacks	4,649	1,503	10,530	3,419
Bolts, nuts, rivets and washers except track	1,185	549	2,266	1,135
Other finished steel	1,594	463	4,285	879
Rolled and finished steel	*315,263*	*110,766*	*608,619*	*218,318*
Cast iron pipe and fittings	8,171	1,978	11,207	4,752
Malleable iron screwed fittings	516	248	1,014	557
Carwheels and axles	1,031	1,327	1,990	2,712
Castings, iron and steel	644	541	1,522	956
Castings, alloy steel, incl. stainless	113	200	313	278
Forgings, plain	1,322	618	3,328	1,015
Forgings, alloy steel, incl. stainless	180	72	467	80
Castings and forgings	*11,977*	*4,984*	*19,841*	*10,350*
Total	671,301	359,690	1,254,822	722,362

Steel Imports Decline To 6467 Tons in February

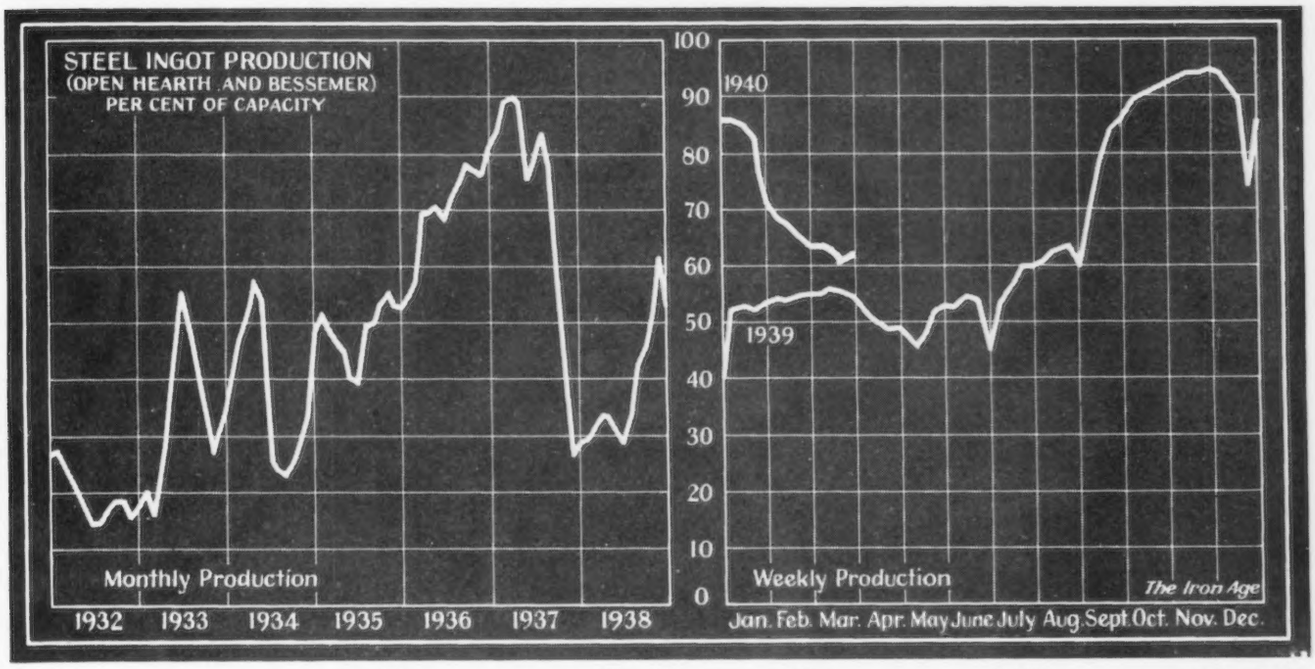
IMPORTS of iron and steel products (scrap excepted) into the United States declined in February when 6467 gross tons of these commodities, valued at $666,272, entered the country, according to the Bureau of Foreign and Domestic Commerce. January imports totaled 7832 tons valued at $918,626 and those of February, 1939, 17,736 tons valued at $1,236,673.

Over the elapsed two months of 1940 this trade, amounting to but 14,299 tons valued at $1,584,898, was only 34 per cent as great in quantity and 53 per cent in value as that of the comparable period of 1939, or 42,067 tons valued at $2,965,818.

IMPORTS—FEBRUARY, 1940
(Gross tons)

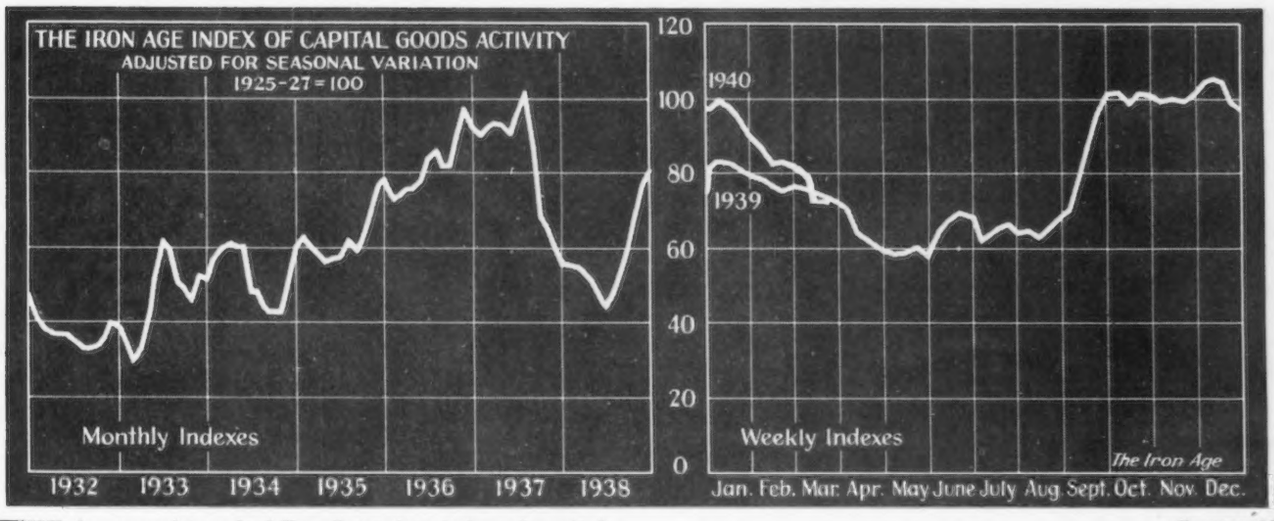
PIG IRON	
Canada	250
India	1,782
IRON ORE	
Sweden	72,563
Canada	189
Mexico	328
Cuba	32,000
Chile	132,000
	237,080
MANGANESE ORE 35 per cent and over	
Russia	7,899
Cuba	6,500
Brazil	2,981
Chile	940
India	5,084
Netherland Indies	299
Union of South Africa	9,405
Gold Coast, W. Africa	4,013
	37,121

Ingot Rate Rises One-Half Point to 61½% of Capacity



District Ingot Production, Per Cent of Capacity	Pitts-burgh	Chicago	Valleys	Phila-delphia	Cleve-land	Buffalo	Wheel-ing	Detroit	Southern	S. Ohio River	Western	St. Louis	East-ern	Aggre-gate
CURRENT WEEK..	58.0	57.0	46.0	63.0	64.0	46.0	62.0	72.0	81.0	55.0	70.0	50.0	85.0	**61.5**
PREVIOUS WEEK..	58.0	56.5	46.0	63.0	66.0	51.5	59.0	80.0	78.0	61.0	70.0	40.0	90.0	**61.0**

Downward Trend of Capital Goods Index Halted



THE downward trend of THE IRON AGE index of capital goods activity, which has carried the index from 100 to 75.5 in 11 weeks, was halted, at least temporarily, in the past week due to slight advances in the lumber and Pittsburgh series. The gain in the Pittsburgh component was the first in several months. The advance in the lumber component may be the herald in usual spring improvement in lumber consumption due to a quickening in the pace of house repairing and building activities. The week's decline in the rate of ingot production was exactly equal to the seasonal factor and the adjusted index of this series remains unchanged, the first time this year that the weekly index has failed to show a loss.

	Week Ended Mar. 30	Week Ended Mar. 23	Comparable Week 1939	Comparable Week 1929
Steel ingot production[1]	80.5	80.5	71.0	121.3
Automobile production[2]	91.7	95.2	76.3	126.8
Construction contracts[3]	59.3	60.0	90.1	142.9
Forest products carloadings[4]	60.4	56.3	50.9	126.3
Production and shipments Pittsburgh District[5]	87.9	85.4	72.3	117.4
Combined index	**76.0**	**75.5**	**72.1**	**126.9**

Sources: [1] THE IRON AGE; [2] Wards Automotive Reports; [3] *Engineering News-Record;* [4] Association of American Railroads; [5] University of Pittsburgh. The indexes of forest products carloadings and activity in the Pittsburgh area reflect conditions as of the week ending March 27. Other indexes cover the week of March 30.

. . . SUMMARY OF THE WEEK . . .

. . . Operations of some steel companies are slightly higher; industry rate 61½ per cent.

° ° °

. . . Production sustained partly by good export orders; domestic buying up a little.

° ° °

. . . Pig iron output in March 8 per cent below that of February; scrap composite lower.

A NUMBER of steel companies have been able to step up their operating rates moderately this week as a result of substantial export bookings and a mild improvement in domestic sales, particularly in areas where more seasonable weather has permitted the beginning of belated outdoor activities.

Some companies estimate their aggregate sales in March at 10 to 15 per cent above those of February, most of the gain having come in the latter half of the month. The rise in production, which has taken place in a number of districts, has been partly offset by declines elsewhere, so that the net result for the industry as a whole is a gain of a half a point to 61½ per cent of capacity.

A part of the gain in orders is also the result of depletion of consumers' steel inventories. Unless consumption of steel should decrease materially, and there is at present no serious indication of that, replenishment of stocks will become necessary in many more cases within the next 30 to 60 days.

Tin plate production is increasing as can companies prepare for a large 1940 use of packers' cans. Tin plate mills are estimated to be operating this week at 61 per cent, up three points over last week.

THE influence of export sales in sustaining steel production should not be underestimated. Export sales of some of the companies that are most active in this trade have ranged from 15 to 20 per cent of total sales within the past few weeks, and during the first two months of the year were close to 10 per cent of the total finished steel production of all companies.

Department of Commerce figures show export shipments of 436,585 gross tons of iron and steel, excluding scrap, in February, a gain of 40,521 tons over January's total. The total of 832,649 tons for the first two months is at an annual rate of close to 5,000,000 tons, or well above the peak of recent years, which was 3,495,467 gross tons in 1937. The January-February total was three times that of the same months in 1939.

Further large sales of ingots to British steel plants are expected. It is estimated that Britain may take between 500,000 and 1,000,000 tons of ingots this year, including about 200,000 tons ordered in January. The British have also been attempting to buy large quantities of toluol from the steel companies here.

If the British and French go ahead with their large contemplated purchases of airplanes in the United States, expenditures by aviation plants for additional machine tools will run into millions of dollars.

Indirect export business is also likely to become a more important factor. In the railroad equipment field, for example, export orders and inquiries are the outstanding business at the moment. A railroad in Siam has bought 500 freight cars from an American company and a Brazilian railroad is inquiring for 15 to 20 locomotives. Inquiries for 40,000 to 50,000 tons of rails have also come from Brazil.

Export prices for steel products have been generally advanced to a level approximating domestic prices. On some products in which price weakness was most acute the new quotations are several dollars a ton above those recently ruling. Outstanding quotations are being protected for a reasonable period.

AMONG the major steel consuming industries new buying of steel is rather light. The automobile industry has good production and an encouraging volume of sales, but its steel requirements over the remainder of the 1940 model season will not be heavy. The building construction industry notes a little pickup in new projects, but business is much below what was expected at this time of year. Railroads are buying very little either for maintenance requirements or for new equipment.

A contemplated gas pipe line, sponsored by the Tennessee Gas & Transmission Co., a new company, to run from northern Louisiana fields to Knoxville, Tenn., would require about 100,000 tons of pipe, but a certificate of authority has not yet been asked of the Federal Power Commission.

PIG iron production in March conformed to the downward trend in steel production. The total for the month, partly estimated, was 3,260,000 net tons compared with 3,311,480 net tons in February. On the daily basis of 105,160 net tons last month, this was a drop of about 8 per cent from the daily rate of 114,189 net tons in February. There were 151 furnaces in blast on April 1, a loss of six from March 1. The rate of operations was 68.9 per cent in February against 75.1 per cent in January.

Scrap markets do not yet point toward returning strength. Declines have taken place this week in several important centers. THE IRON AGE scrap composite price has declined 21c. to $16.08, 46c. above its level just before the outbreak of the European war.

The downward trend in THE IRON AGE capital goods index has halted, at least temporarily. The index figure for the week ended March 30 is 76 compared with 75.5 for the week before and 72.1 a year ago.

A Comparison of Prices

Market Prices at Date, and One Week, One Month, and One Year Previous
Advances Over Past Week in Heavy Type, Declines in Italics

Rails and Semi-finished Steel

Per Gross Ton:	Apr. 2, 1940	Mar. 26, 1940	Mar. 5, 1940	Apr. 4, 1939
Rails, heavy, at mill	$40.00	$40.00	$40.00	$40.00
Light rails: Pittsburgh, Chicago, Birmingham	40.00	40.00	40.00	40.00
Rerolling billets: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmigham, Sparrows Point	34.00	34.00	34.00	34.00
Sheet bars: Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point	34.00	34.00	34.00	34.00
Slabs: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point	34.00	34.00	34.00	34.00
Forging billets: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham	40.00	40.00	40.00	40.00
Wire rods: Nos. 5 to 9/32 in., Pittsburgh, Chicago, Cleveland, cents per lb.	2.00	2.00	2.00	1.92
Skelp, grvd. steel: Pittsburgh, Chicago, Youngstown, Coatesville, Sparrows Point, cents per lb.	1.90	1.90	1.90	1.90

Finished Steel

Cents Per Lb.:				
Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham	2.15	2.15	2.15	2.25
Plates: Pittsburgh, Chicago, Gary, Birmingham, Sparrows Point, Cleveland, Youngstown, Coatesville, Claymont	2.10	2.10	2.10	2.10
Structural shapes: Pittsburgh, Chicago, Gary, Buffalo, Bethlehem, Birmingham	2.10	2.10	2.10	2.10
Alloy bars: Pittsburgh, Buffalo, Bethlehem, Massillon, or Canton	2.70	2.70	2.70	2.80
Cold finished bars: Pittsburgh, Buffalo, Cleveland, Chicago, Gary	2.65	2.65	2.65	2.70
Hot rolled strip: Pittsburgh, Chicago, Gary, Cleveland, Middletown, Youngstown, Birmingham	2.10	2.10	2.10	2.15
Cold rolled strip: Pittsburgh, Cleveland, Youngstown	2.80	2.80	2.80	2.95
Sheets, galv., No. 24: Pittsburgh, Gary, Sparrows Point, Buffalo, Middletown, Youngstown, Birmingham	3.50	3.50	3.50	3.50
Hot rolled sheets: Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Sparrows Point, Cleveland, Youngstown, Middletown	2.10	2.10	2.10	2.15
Cold rolled sheets: Pittsburgh, Chicago, Gary, Buffalo, Youngstown, Cleveland, Middletown	3.05	3.05	3.05	3.20
Wire nails: Pittsburgh, Chicago, Cleveland, Birmingham	2.55	2.55	2.55	2.45
Plain wire: Pittsburgh, Chicago, Cleveland, Birmingham	2.60	2.60	2.60	2.60
Tin plate, 100 lb. base box: Pittsburgh and Gary	$5.00	$5.00	$5.00	$5.00

Pig Iron

Per Gross Ton:				
No. 2 fdy., Philadelphia	$24.84	$24.84	$24.84	$22.84
No. 2, Valley furnace	23.00	23.00	23.00	21.00
No. 2, Southern Cin'ti	23.06	23.06	23.06	21.06
No. 2, Birmingham	19.38	19.38	19.38	17.38
No. 2, foundry, Chicago†	23.00	23.00	23.00	21.00
Basic, del'd eastern Pa.	24.34	24.34	24.34	22.34
Basic, Valley furnace	22.50	22.50	22.50	20.50
Malleable, Chicago†	23.00	23.00	23.00	21.00
Malleable, Valley	23.00	23.00	23.00	21.00
L. S. charcoal, Chicago	30.34	30.34	30.34	28.34
Ferromanganese, seab'd carlots	100.00	100.00	100.00	80.00

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton.

Scrap

Per Gross Ton:				
Heavy melting steel, P'gh	*$16.25*	$16.75	$17.00	$15.75
Heavy melting steel, Phila.	16.75	16.75	17.25	15.75
Heavy melting steel, Chgo	*15.25*	15.375	15.875	14.25
Carwheels, Chicago	16.75	16.75	17.25	13.00
Carwheels, Philadelphia	20.25	20.25	20.25	16.75
No. 1 cast, Pittsburgh	*17.75*	18.25	18.25	15.50
No. 1 cast, Philadelphia	20.25	20.25	20.25	16.75
No. 1 cast, Ch'go (net ton)	13.25	13.25	14.25	12.75

Coke, Connellsville

Per Net Ton at Oven:				
Furnace coke, prompt	$4.00	$4.00	$4.00	$3.75
Foundry coke, prompt	5.25	5.25	5.25	4.75

Non-Ferrous Metals

Cents per Lb. to Large Buyers:				
Copper, electrolytic, Conn.	11.50	11.50	11.50	10.75
Copper, lake, New York	11.50	11.50	11.50	11.375
Tin (Straits), New York	*45.875*	46.00	47.50	46.25
Zinc, East St. Louis	5.75	5.75	5.75	4.50
Zinc, New York	6.14	6.14	6.14	4.89
Lead, St. Louis	*5.05*	5.15	5.25	4.70
Lead, New York	*4.85*	5.00	5.10	4.85
Antimony (Asiatic), N. Y.	16.50	16.50	16.50	14.00

On export business there are frequent variations from the above prices. Also in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables.

The Iron Age Composite Prices

	Finished Steel	Pig Iron	Steel Scrap
April 2, 1940	2.261c. a Lb.	$22.61 a Gross Ton	$16.08 a Gross Ton
One week ago	2.261	22.61	16.29
One month ago	2.261	22.61	16.71
One year ago	2.286	20.61	15.25

Based on steel bars, beams, tank plates, wire, rails, black pipe, sheets and hot-rolled strip. These products represent 85 per cent of the United States output.

Based on average for basic iron at Valley furnace and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

	Finished Steel HIGH	Finished Steel LOW	Pig Iron HIGH	Pig Iron LOW	Steel Scrap HIGH	Steel Scrap LOW
1940					$17.67, Jan. 2	$16.08, Apr. 2
1939	2.286c., Jan. 3	2.236c., May 16	$22.61, Sept. 19	$20.61, Sept. 12	22.50, Oct. 3	14.08, May 16
1938	2.512c., May 17	2.211c., Oct. 18	23.25, June 21	19.61, July 6	15.00, Nov. 22	11.00, June 7
1937	2.512c., Mar. 9	2.249c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.92, Nov. 10
1936	2.249c., Dec. 28	2.016c., Mar. 10	19.73, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June 9
1935	2.062c., Oct. 1	2.056c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr. 29
1934	2.118c., Apr. 24	1.945c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	1.953c., Oct. 3	1.792c., May 2	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.915c., Sept. 6	1.870c., Mar. 15	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	1.981c., Jan. 13	1.883c., Dec. 29	15.90, Jan. 6	14.79, Dec 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.192c., Jan. 7	1.962c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.236c., May 28	2.192c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3

. . . THIS WEEK'S MARKET NEWS . . .

STEEL OPERATIONS

. . . Rate for industry is slightly higher at 61½%

A NUMBER of steel companies have lifted their operating rates slightly this week as a result of a moderately better flow of orders and specifications. However, no general upward trend has developed, as is indicated by the fact that production in some districts has declined.

Gains have been recorded in the CHICAGO district, which is up half a point to 57 per cent; in the WHEELING-WEIRTON district, which is three points higher at 62 per cent; in the BIRMINGHAM district, where the rate is three points higher at 81 per cent; in the SOUTHERN OHIO district, which has risen four points to 55 per cent, and in the ST. LOUIS district, which is up 10 points to 50 per cent.

Losses have occurred in the CLEVELAND-LORAIN, BUFFALO, DETROIT and EASTERN (New England) district. Elsewhere, including the PITTSBURGH district, operations are unchanged from last week.

PRICES

. . . Export prices advanced by major companies at about domestic levels

EXPORT prices for steel products have been advanced by some of the major steel companies to a level approximating domestic prices. On some products the current quotations are several dollars a ton above those that have ruled on recent export transactions.

For example, on plates, which was one of the weakest items, having dipped below 2c. a lb., f.a.s., the current quotation is 2.15c. a lb., f.a.s. Structural shapes take the same quotation, bars are generally quoted at 2.35c., galvanized sheets at 3.65c. and hot rolled sheets, No. 24 gage, at 3.15c.

New quotations are expected to apply on all new business. Outstanding quotations at lower prices will be protected for a reasonable period.

Domestic quotations on major products are firm, but concrete bar prices are highly irregular and range between 1.70c. and 1.90c. a lb., f.o.b. major basing points.

Hot rolled bar makers have announced some minor changes in extras on half round merchant bars and for cutting, effective April 1.

Formed galvanized roofing and siding quotations continue weak in the South and certain sections of the Southwest.

Chemical ranges on 18-8 stainless steel were altered, effective April 1.

NEW BUSINESS

. . . Orders moderately better but no strong trend has developed

AGGREGATE steel bookings at PITTSBURGH in March closely approximated February volume. Activity in the last two weeks, however, has been at a slightly faster pace than during the first two weeks of March. Individual steel orders remain small, but the actual number placed has been slowly expanding. While there are no definite signs of an important upward trend, a small seasonal upswing is expected to be reflected in April and May sales volume. To a great extent, export sales continue to bolster an otherwise dull domestic market. Incoming orders in the past week, including both domestic and foreign, would probably support 45 to 50 per cent ingot output.

New business of CLEVELAND steel producers during March averaged around 80 per cent of March production, and showed a fair gain over February on the day-to-day basis. Shipments were just about equal to the February level. Breaking down the month's business, it is found that principal support emanated from the export, automotive and agricultural implement industries. The foreign field is expected to continue good during second quarter, the construction industry is becoming more prominent each day, and there is likelihood of additional railroad carbuilding.

Biggest disappointment of the season has been the lack of farm buying of fence and kindred products. The cold weather forced abandonment of many farm repair and improvement programs.

Alloy steels continue in good demand, and deliveries of Ohio producers are more satisfactory to the user than at any time in months, partly due to new capacity.

CHICAGO finally is experiencing milder weather and steel business is expected to benefit therefrom. March bookings ranged from slightly below the February total to between 10 and 15 per cent above. Where increases were reported miscellaneous buying of a wide line of steel products appeared responsible. One large mill reported a fair increase over last week, sheet demand from makers of stoves and refrigerators, and tin plate being important factors. Makers of machine tools, electrical appliances and agricultural implements are probably the most active consumers around Chicago at present. Structural inquiries nationally last week were understood to be above the 1939 weekly average, and were about double the total for the previous week.

CHICAGO alloy steel sellers report an unusually large number of small orders last week, the automobile and oil industries remaining the chief single customers.

Improvement in new business at ST. LOUIS is almost negligible, with consumers optimistic although holding down on orders to meet immediate needs. Inventories are low, which is a hopeful sign. Flat rolled products seem to be most in demand.

Operations continue too slacken at Pacific Coast mills as new business fails to keep pace. Fabricated plates continue to be the most active division on the pending list.

A small pickup in miscellaneous orders was experienced by PHILADELPHIA sellers in the past week and a generally more optimistic sentiment is in evidence on the part of both buyers and sellers. Part of this optimism is derived from the fact that unless steel consumption declines abruptly within the next three or four weeks, the necessity of placing new orders will be forced upon sellers. Consumption in the PHILADELPHIA area has been outstripping steel shipments for some time and consumers' inventories are rapidly being exhausted. The week's small gain in new orders is considered as being caused by this need to replenish portions of stock piles. A district automobile parts maker has placed a few small orders lately for material to clean up runs on the 1940 models and is at present preparing estimates for preliminary runs on the 1941 models. Shipyard releases are in very moderate volume currently, but are expected to gain momentum within the next three weeks. Canadian business has shown a slight increase lately.

Under its newly adopted six-month purchase plan, the Navy Department

has awarded 9959 tons of steel to the Carnegie-Illinois Steel Corp. and 4160 tons to the Alan Wood Steel Co.

The Carnegie-Illinois awards consist of 5549 tons of medium black, 167 tons of high tensile galvanized, 267 tons of medium galvanized and 39 tons of high tensile black plates; 2962 tons of medium black, 219 tons of medium galvanized, 41 tons of high tensile black and three tons of high tensile galvanized shapes; 111 tons of medium black and 62 tons of galvanized bars.

The Alan Wood contract consists of 3376 tons of medium black, 425 tons of medium galvanized, 175 tons of high tensile black and 11 tons of high tensile galvanized plates and 111 tons of medium black and 62 tons of medium galvanized sheets and strips.

The steel is to be delivered by Aug. 31. The bids were opened on March 12. Because of the new basis of purchase an unusual length of time was required for their consideration since such new elements as buying on carlot rather than less-than-carload quantities were involved.

PIG IRON

. . . Export inquiry stands out in otherwise featureless market

EXPORT inquiry continues to feature a market which otherwise is quiet and without indications of early change. Two inquiries of 10,000 tons each have been received from foreign buyers. The melting rate at most centers is barely holding. At CLEVELAND, more sellers are coming into the market after working off inventories built up late last year, but current orders are small. Die shops and machine tool foundries are the most active but jobbing foundries in Ohio and elsewhere have again reduced operations.

A very slight improvement in CHICAGO district pig iron shipments was reported for March over February. Foundry coke shipments declined slightly. Sellers are expecting an improvement in pig iron shipments during April, an important factor in this prediction being the knowledge that consumer inventories were being worked down through all of March. Foundry melt last month was maintained at approximately the February level.

New business at PITTSBURGH is slow in developing. Meanwhile, consumers are rapidly depleting inventories. Some steel makers have reduced output of some blast furnaces rather than resort to banking the stacks. Orders in the PHILADELPHIA area, while still limited to 100-ton lots, were in better volume in the past week and most sellers are optimistic about potential April business.

The SOUTHERN OHIO pig iron market is unchanged. Shipments are steady, but no new business is reported following quiet covering earlier this month. Foundry operations show no change.

Foundrymen's interest at BOSTON the past week centered in the New England Regional Foundry Conference at Massachusetts Institute of Technology, and in the shrinking orders for castings. However, special machinery, textile machinery and airplane parts manufacturers continued active and small tonnages of iron were purchased by them for mixture purposes. Machine tool builders are less active, there having been a noticeable slump in new business. The average foundry is intent on reducing inventories as much as possible. On the other hand an occasional foundryman believes there will be a pickup in business in April. March went out with the aggregate New England foundry industry operating at just about 60 per cent of capacity.

Shipments of pig iron for March in the ST. LOUIS area will show a slight increase over February, but new business is exceedingly light. BUFFALO merchant iron producers report more business with March volume 30 per cent heavier than that of February. Consumers generally are using more iron.

SEMI-FINISHED STEEL

. . . Specifications gained substantially in March at Pittsburgh

SEMI-FINISHED specifications at PITTSBURGH in March were substantially greater than in February. Although a good portion of this improvement was attributed to export demand, it also reflected an increase in requirements from non-integrated steel makers. Fresh business in the past week at PITTSBURGH, if anything, was a shade above a week ago, although weekly data continue to be affected by periodic buying habits on the part of large purchasers.

March order volume at CLEVELAND showed a respectable gain over February, and sales in the past few days have been holding up well. CLEVELAND mills have not shared export business to the same extent as certain other districts, but recent production has included some orders booked in early January at good prices. Domestic sales show numerical improvement.

PLATES

. . . Eastern Pennsylvania producers report moderate gains

SPECIFICATIONS at PITTSBURGH are in about the same volume as a week ago with export business still a factor.

Bookings by EASTERN PENNSYLVANIA producers during the last three days of the past week showed an encouraging gain over the early part of the week and producers generally feel that this improvement will be maintained throughout April. Demand is still on a widely diversified basis, but substantial shipyard releases are expected to materialize within the next three weeks. Buying of commercial grades of plates by Canadian sources showed an encouraging gain in March and are expected to expand further in April. The demand for marine boiler material is developing strongly in such countries as Italy, Portugal and Scandinavia, but tonnages involved in this business are not large. Quotations on export business are now generally on a parity with domestic prices, but the depreciation of Sterling and the steadily increasing freight rates are expected to test this level if domestic producers are to meet Continental competition.

A proposal to build a pipe line requiring about 3500 tons of plates will be voted on shortly in PHILADELPHIA. Formal award of the Navy requirements for the next six months has been made with 9959 tons going to Carnegie-Illinois Steel Corp. and 4160 tons to Alan Wood Steel Co. Dissatisfaction with the method employed in making these awards is expressed in several quarters and the matter is being discussed with Navy officials. This dissatisfaction in most cases is based on the fact that should the method employed in making these awards be considered a precedent, it might work to the detriment of EASTERN PENNSYLVANIA producers.

Domestic plate business has shown a slight gain in the NEW YORK area, but many plate consuming lines are still behind in their normal spring pickup. After a period of rapidly falling prices, some stability has been achieved in the export plate market and most sellers are now quoting 2.15c. per lb. f.a.s. A few days' grace has been given on quotations outstanding.

which had dipped below 2c. Now that the market has been stabilized, it is expected that a fair volume of impending orders will be released.

Bethlehem Steel Co. will build seven steel barges for the Central Barge Co., CHICAGO, taking about 1500 tons of plates and shapes.

STRUCTURAL STEEL

. . . Inquiries are more numerous but awards are light

AMONG fabricated structural steel lettings of 8750 tons, which are slightly higher than a week ago, the only sizable award is 1500 tons for a Chesapeake & Potomac Telephone Co. building at Baltimore.

New structural steel projects advanced to 16,800 tons from 6600 tons in the previous week. The largest new inquiries are 6000 tons for the Delaware, Lackawanna & Western Railroad grade crossing elimination at Syracuse, N. Y.; 1600 tons for an apartment building in Cleveland, and 1000 tons for rebuildng a blast furnace for the Youngstown Sheet & Tube Co., at Youngstown.

The outlook for new jobs is about the same as it was a month ago, the level being somewhat below what fabricators had hoped for. A pick up in export fabricating business has been noted recently.

BOLTS, NUTS AND RIVETS

. . . Orders in March ran slightly ahead of February total

AGGREGATE March order volume of CLEVELAND producers was ahead of February by a small margin. The backbone of recent buying has come from the automotive industry which is expected to remain active for several weeks more. Agricultural implement requirements, export demand, and railroad business have assisted bookings also.

SHEETS AND STRIP

. . . March orders ran moderately ahead of February volume

SHEET orders at PITTSBURGH during March ran ahead of the volume booked in February. However, in the latter month orders were at a low level. Although aggregate tonnage was slightly higher last month, the notable change from February activity was in the number of actual orders placed. This trend continued to carry through in the past week.

Incoming tonnage at CLEVELAND is fair. In addition to export demand, requirements of refrigerator makers and cold rollers catering to the automotive industry are helping to buoy operations. Definite improvement has been noted in the past few days as a result of better activity in construction.

CHICAGO mills are offering heavy hot rolled sheets in one week to 10 days and light hot rolled sheets in four to five weeks. Light flat galvanized sheets are available in four to five weeks, cold rolled in three to four weeks and iron enameling stock in four weeks. Heavy galvanized sheets can be delivered in two to three weeks. Only a slight gain in bookings developed in CHICAGO last week, the increase being accounted for mainly by stove and refrigerator plants. No unusual tonnages were received from DETROIT.

A steady upward movement of sheet demand is shown in SOUTHERN OHIO bookings. Currently, the demand is about 53 per cent of mill capacity. Demand for galvanized sheets has been increasing steadily following unseasonable lows in February, which, with well sustained business in electrical and stainless sheets helps to offset the present slowing in automotive ordering.

Several small orders covering material to clean up runs on 1940 models have been placed recently by an automobile parts maker in the PHILADELPHIA area. This interest is preparing preliminary specifications for a part of the 1941 model requirements and is expected to have these requirements out for bidding shortly.

Sheet business in the NEW YORK area remains light and spotty, but there are a few bright spots in the picture. One seller reports March volume about double that of February and equal to January bookings.

Export prices have firmed up. The f.a.s. price of galvanized sheets, for example, is now about 3.65c. per lb., while hot rolled sheets, No. 24 gage, are quoted at 3.15c.

REINFORCING BARS

. . . Soldiers barracks in Canal Zone take 6000 tons

REINFORCING steel awards call for 10,100 tons. New reinforcing steel projects of 6800 tons include 1800 tons at Bethesda, Md., for a building at the Naval Medical Center; 1200 tons at Saint Georges, Del., for the high level bridge superstructure, and 1050 tons for a section of the Chicago subway.

Tucker McClure, Los Angeles, contractor for the Pacific unit of the Panama Canal barracks and officers' quarters, last week awarded 6000 tons of bars to take care of this project. The Atlantic unit of the barracks and officers' quarters, requiring about 5000 tons of bars, is expected to be let soon.

Concrete bar prices remain highly irregular with the going price f.o.b. in the Eastern and Mid-Western areas ranging from $1.70 to $1.90 a 100 lb. f.o.b. major basing points. Jobbers in many cases are able to get the top of this range from contractors while some mill interests continue to book jobs at the lower figure.

Bids have been set by the United States Engineer, Los Angeles, for April 25 on Fullerton Dam, taking 350 tons, and for April 29 on Section V, Los Angeles River improvement, taking 4780 tons. Columbia Steel Co., San Francisco, is low on 2650 tons for the bureau's Shasta Power Plant. Inquiries for Government agencies make up nearly the entire Pacific Coast pending list.

MERCHANT BARS

. . . March bookings up slightly . . . Some extras revised

HOT rolled bar bookings at PITTSBURGH last month were at a trifle higher level than February bookings. An analysis of order books, however, would no doubt disclose that this showing was made possible by a substantial increase in orders from abroad. Fresh business in the past week showed little or no change from previous weeks.

A pickup in domestic and export inquiries for merchant bars has been noted at CLEVELAND recently. March orders on the day-to-day basis were comfortably ahead of February, principally because of export buying and requirements of the agricultural implements industry.

Demand for bars in the CHICAGO district has not increased substantially in the last week but bookings during April are expected to show some improvement. Among the most active

Some bar makers have revised size extras on half rounds with some of the smaller dimensions being increased 25c. a 100 lb. In addition to expanding the number of size extras

by one in the larger sizes, slightly upward adjustments have been made there also. The language in the hot rolled bar cutting extras has again been revised, resulting especially in a more liberal attitude with respect to bars over 120 in. in length when the customer will accept random lengths within a certain percentage of total ordered weight.

WAREHOUSE BUSINESS

. . . Orders well diversified but total volume is not large

ALTHOUGH total warehouse sales at PITTSBURGH during March were off 8 to 10 per cent from the February level on a tonnage basis, there were in some instances an actual increase in the number of customers placing orders. Individual bookings, however, are involving a smaller amount of steel than was the case a month ago. Easier deliveries at steel mills have, of course affected warehouse business but demand on the whole continued fairly well diversified in March.

After a slow start, March order volume of CLEVELAND warehouses proved better than expected. Some sellers were unable to overcome the effect of the dull period at the start of the month and as a result finished with total new business slightly below that of February.

March sales at CHICAGO were about on a par with February. Distribution as to products and industries was well diversified. Increased activity is expected this month largely because of the higher seasonal volume of outdoor construction.

TIN PLATE

. . . Operations improve from better flow of specifications

TIN plate operations are estimated this week at 61 per cent, up three points from a week ago. The improved activity is the result of a continuation of the better flow of specifications to the mills, a condition which materialized a few weeks ago.

WIRE PRODUCTS

. . . Weather conditions have delayed buying of merchant items

ALTHOUGH some expansion in merchant wire requirements has been noted at PITTSBURGH recently, the improvement has been somewhat less than had been expected. Whether or not the loss in business as the result of weather conditions will be regained remains to be seen. Wire rod specifications in March totaled little, if any, above February bookings but incoming manufacturers' wire business in March was at a faster clip than in February. No significant changes occurred in the wire market in the past week.

Sales at CLEVELAND show only a moderate increase, principally in merchant wire products. The latter have not improved in volume to the extent expected, because of adverse weather which has hampered farm improvements. Jobber stocks are large. Export inquiry and sales continue well maintained.

New business during March at CHICAGO sales offices was about even with that of the previous month. Volume of inquiries has increased within the last week, however, mostly for manufacturers' wire, and April should show an improvement in all lines.

New galvanizing extras discussed in this column March 7 are printed in full as follows:

Gage	Type 1	Type 2	Type 3
Coarser than ½-in. dia.	$0.90	$0.90	$1.15
Coarser than ⅜ to ½-in. incl.	0.90	0.90	1.15
⅜-in. to No. 5 incl.	0.90	0.90	1.15
6	0.65	0.75	0.90
7	0.65	0.75	0.90
8	0.65	0.75	0.90
9	0.65	0.75	0.90
10	0.65	0.75	0.95
11	0.65	0.75	0.95
12	0.70	0.85	1.05
13	0.75	0.95	1.20
14	0.85	1.10	1.35
15	0.95	1.30	1.65
16	1.00	1.50	2.05
17	1.10	1.65	2.25
18	1.40	2.15	2.90
19	1.50	2.30	3.20
20	1.60	2.55	3.50

TUBULAR GOODS

. . . Improvement is slow and of small importance

PIPE sales at PITTSBURGH were in greater volume in March than in February, although the increase from a tonnage standpoint was not great. Oil country goods specifications in the past week continued their slow upward trend and there was slightly more activity noted in standard pipe demand.

The Tennessee Gas & Transmission Co., a newly chartered company, is reported to be contemplating an 800-mile gas line to run from the northern Louisiana fields to Knoxville, Tenn. How soon this will materialize remains to be seen, but such a project, estimating the use of 16-in. pipe, would require more than 100,000 tons of steel.

RAILROAD BUYING

. . . Export orders and inquiries feature of this market

EXPORT buying came to the fore in the railroad market in the past week with a Siam railroad interest ordering 500 box cars from Magor Car Corp., and two Brazilian roads issuing bids for a total of 40,000 to 50,000 tons of rails. An inquiry from Brazil for 15 to 20 type 2-10-2 locomotives is also current. Final action on the rail inquiry is not expected to be forthcoming in the near future owing to factors involved in the contemplated purchase.

New domestic inquiries include 50 hopper cars for Rock Island, 16 dump cars for Tennessee Coal, Iron & Railroad Corp., and two diesel-electric locomotives, 24 freight cars, two baggage and two passenger cars for Alaska Railroad. Utah Copper Co. has awarded 10 dump cars to Pressed Steel Car Co.

Weekly Bookings of Construction Steel

	Week Ended				Year to Date	
	Apr. 2, 1940	Mar. 26, 1940	Mar. 5, 1940	Apr. 4, 1939	1940	1939
Fabricated structural steel awards	8,750	7,500	36,100	20,600	213,310	242,885
Fabricated plate awards	2,685	6,670	170	4,365	44,030	45,545
Steel sheet piling awards	1,400	380	0	0	10,170	14,105
Reinforcing bar awards	10,100	4,900	9,950	5,325	112,020	128,970
Total Letting of Construction Steel	22,935	19,450	46,220	30,290	379,530	431,505

FABRICATED STEEL

AWARDS

NORTH ATLANTIC STATES

1500 Tons, Baltimore, building for Chesapeake & Potomac Telephone Co., to Bethlehem Steel Co., Bethlehem, Pa.

600 Tons, Philadelphia, building for Westinghouse Electric & Mfg. Co., to Bethlehem Steel Co., Bethlehem, Pa.

480 Tons, Philadelphia, Navy Yard structural laboratory, to Lehigh Structural Steel Co., Allentown, Pa.

400 Tons, New York, building at 43rd Street and Broadway, to American Bridge Co., Pittsburgh.

380 Tons, Schenectady, N. Y., diesel locomotive shop extension for American Locomotive Co., to American Bridge Co., Pittsburgh.

300 Tons, Bristol, R. I., spinning mill, to James H. Tower Iron Works, Providence, R. I.

260 Tons, Hoffmans, N. Y., bridge C-3 for New York Central Railroad Co., to American Bridge Co., Pittsburgh.

225 Tons, New York, Aeronautics Academy, North Beach Airport, to Lehigh Structural Steel Co., Allentown, Pa.

220 Tons, Brooklyn, South Brooklyn Savings Bank, to Bethlehem Steel Co., Bethlehem, Pa.

185 Tons, Monessen, Pa., pit furnace building extension, Pittsburgh Steel Co., to Pittsburgh Bridge & Iron Co., Pittsburgh.

160 Tons, Saratoga Springs, N. Y., Skidmore College laboratory, to Utica Structural Steel Co., Utica, N. Y.

140 Tons, Waterbury, Conn., St. Mary's Hospital, to Standard Structural Steel Co., Hartford, Conn.

140 Tons, Bayonne, N. J., General Cable Co. building, to Belmont Iron Works, Philadelphia.

130 Tons, Brooklyn, crane runway for Schiavone & Bonomo Corp., to American Bridge Co., Pittsburgh.

115 Tons, New York, curbing, East River Drive, 57th to 64th Streets, to Bethlehem Steel Co., Bethlehem, Pa.

105 Tons, Allegany County, N. Y., State highway bridge, to Genesee Bridge Co., Rochester, N. Y.

105 Tons, Southport, Conn., New York, New Haven & Hartford Railroad bridge, to Bethlehem Steel Co., Bethlehem, Pa.

THE SOUTH

250 Tons, Velasco, Tex., Dow Chemical Co. buildings, to Consolidated Steel Co. of Texas, through Austin Co., Cleveland, general contractor.

115 Tons, Taylor County, W. Va., bridges, to Riverside Steel Co., Wheeling, W. Va.

CENTRAL STATES

400 Tons, Painesville, Ohio, factory building for Industrial Rayon Corp., to Ingalls Iron Works Co., Birmingham.

285 Tons, Midland, Mich., Dow Chemical Co. building, to Flint Structural Steel Co., Flint, Mich.

270 Tons, Cleveland, East Ninth Street underpass, to American Bridge Co., Pittsburgh.

250 Tons, Elyria, Ohio, Elyria Foundry Division, Industrial Brownhoist Corp., to Builders Structural Steel Co., Cleveland.

200 Tons, Allen Park, Mich., Wabash Railway grade elimination, to American Bride Co., Pittsburgh.

140 Tons, Des Moines, Iowa, State bridge FA-216, to Pittsburgh-Des Moines Steel Co., Pittsburgh.

120 Tons, Rantoul, Ill., hangar annexes, to Bethlehem Steel Co., Bethlehem, Pa.

120 Tons, Saginaw, Mich., addition, Saginaw Steering Gear Co. building, to Flint Structural Steel Co., Flint, Mich.

120 Tons, Cinder, Iowa, girders for Milwaukee Road, to American Bridge Co., Pittsburgh.

100 Tons, Cleveland, Socialer TurnVerein Hall, to Builders Structural Steel Co., Cleveland.

100 Tons, Cleveland, fabricated coke bins for Republic Steel Corp., to Lackawanna Steel Construction Co., Buffalo.

WESTERN STATES

300 Tons, San Quentin, Cal., prison building, to Golden Gate Iron Works, San Francisco.

200 Tons, Redwood City, Cal., warehouse, to Moore Dry Dock Co., Oakland, Cal.

165 Tons, Oakland, Cal., Allis-Chalmers Co., tractor division, building, to Moore Dry Dock Co., Oakland, Cal.

HAWAII

155 Tons, Pearl Harbor, turbo-alternator support, to Joseph T. Ryerson & Son, Inc., Chicago.

PENDING STRUCTURAL PROJECTS

NORTH ATLANTIC STATES

6000 Tons, Syracuse, N. Y., grade crossing elimination for Delaware, Lackawanna & Western Railroad.

760 Tons, Millville, N. J., building for Armstrong Cork Co.; bids April 8.

600 Tons, Harrisburg, N. J., highway bridge.

550 Tons, Southport and Fairfield, Conn., beam spans for New York, New Haven & Hartford Railroad Co.

480 Tons, Queens, N. Y., vehicular underpass at Bush Street; bids April 5.

300 Tons, Lancaster, Pa., building for Armstrong Cork Co.

250 Tons, Springfield, Vt., State bridge.

240 Tons, Dushore, Pa., State highway bridge.

220 Tons, Hudson, N. Y., State boiler plant and trestle.

150 Tons, New York, Hutchinson River Parkway bridge, Triboro Bridge Authority; bids April 4.

120 Tons, Newark, Del., research laboratory; being rebid.

SOUTH AND SOUTHWEST

450 Tons, Davis-Forsyth Counties, N. C., State bridge over Yadkin River.

250 Tons, Raton, N. M., bridge; bids April 5.

220 Tons, Morgantown, W. Va., building for Great Atlantic & Pacific Tea Co.

CENTRAL STATES

1600 Tons, Cleveland, Edgewater Tower apartment building.

1000 Tons, Youngstown, rebuilding blast furnace C, Youngstown Sheet & Tube Co.

550 Tons, Peru and Bunker Hill, Ind., rebuilding bridges for Nickel Plate Railroad.

425 Tons, Kansas City, Mo., municipal bridge over Blue River; bids April 16.

385 Tons, Muskegon Heights, Mich., sewage disposal plant; bids in.

330 Tons, Cleveland, ore storage building for Aluminum Co. of America.

300 Tons, Chicago, subway section D-6-E; bids April 18.

200 Tons, Bunker Hill, Ind., railroad bridge No. 1347.

150 Tons, Cleveland, grade elimination bridge.

125 Tons, Omaha, Neb., bridge No. 100.87 for Union Pacific Railroad Co.

125 Tons, Hamel, Minn., State bridge No. 5847.

WESTERN STATES

600 Tons, State of Colorado, three highway bridges; bids to be taken by U. S. Engineers, at Caddoa, Colo.

240 Tons, Gardiner, Mont., Lamar River bridge.

200 Tons, Yellowstone Park, Wyo., bridge for Public Roads Administration; bids April 4.

FABRICATED PLATES

AWARDS

1500 Tons, Chicago, seven steel barges for Central Barge Co., to Bethlehem Steel Co., Bethlehem, Pa.

1185 Tons, Houston, Tex., 31 tanks for Sinclair Refining Co., to Chicago Bridge & Iron Co., Chicago.

PENDING PROJECTS

600 Tons, San Francisco, pressure vessels for refinery.

SHEET PILING

AWARDS

800 Tons, Cleveland, Cuyahoga River improvement, contract No. 22, cut 5-C., to Carnegie-Illinois Steel Corp., Pittsburgh, through L. A. Wells Construction Co.

500 Tons, Genoa, Wis., power plant, Tri-State Power Cooperative, to Bethlehem Steel Co., Bethlehem, Pa.

100 Tons, Cleveland, blast furnace foundations for Republic Steel Corp., to Carnegie-Illinois Steel Corp., Pittsburgh.

PENDING PROJECTS

1300 Tons, Cleveland, Cuyahoga River improvement, contract No. 23; bids April 4.

350 Tons, Kansas City, Mo., municipal bridge over Blue River; bids April 16.

REINFORCING STEEL

. . . Awards of 10,100 tons; 6800 tons in new projects

AWARDS

ATLANTIC STATES

750 Tons, Niagara Falls, N. Y., superstructure, Rainbow Bridge, to Bethlehem Steel Co., Bethlehem, Pa.

400 Tons, Philadelphia, Government aeronautical laboratory, to Bethlehem Steel Co., Bethlehem, Pa.

100 Tons, Northfield, N. J., hospital for mental diseases, to Bethlehem Steel Co., Bethlehem, Pa.; Golder Construction Co., contractor.

SOUTH AND CENTRAL

975 Tons, Chicago, Wesley Memorial Hospital, to Inland Steel Co., Chicago.

200 Tons, Genoa, Wis., power plant, Tri-State Power Cooperative, to Truscon Steel Co., Youngstown.

120 Tons, Clayton, Ind., paving work, to Laclede Steel Co., St. Louis.

115 Tons, Owensboro, Ky., vocational school, to Pollak Steel Co., Cincinnati.

110 Tons, Cleveland, Nurses' Home, St. Johns Hospital, joists, to Armenite Co., Cleveland.

110 Tons, Akron, Hardesty Park storm sewer, to Truscon Steel Co., Youngstown.

WESTERN STATES

290 Tons, Kettle Falls, Wash., Kettle Falls bridge (Invitations B-38167-A and B-38177-A), to Bethlehem Steel Co., San Francisco.

288 Tons, Phoenix, Ariz., Sears, Roebuck & Co. store, to Ceco Steel Products Co., Los Angeles, through Del E. Webb Construction Co., Phoenix, Ariz.

250 Tons, Odair, Wash., Grand Coulee Dam (Invitation 38162), to Bethlehem Steel Co., San Francisco.

119 Tons, Cody, Wyo., Shoshone project (Invitation 48277-A), to Colorado Fuel & Iron Corp., Denver.

108 Tons, Cody, Wyo., Shoshone project (Invitation 48272-A), to Bethlehem Steel Co., San Francisco.

CANAL ZONE

6000 Tons, Panama Canal, Pacific sector of soldiers' barracks and officers' quarters, to Bethlehem Steel Co., through Tucker McClure, Los Angeles, contractor.

150 Tons. Panama Canal, Schedule No. 3969, to Youngstown Sheet & Tube Co., Youngstown, Ohio.

PENDING REINFORCING BAR PROJECTS

ATLANTIC STATES

1800 Tons, Bethesda, Md., Naval Medical Centre; bids April 23.

1200 Tons, Saint Georges, Del., substructure, high level bridge.

600 Tons, Baltimore, Frederick Douglas housing project; bids April 10.

460 Tons, Queens County, N. Y., Bush Street vehicular underpass; bids April 5.

150 Tons, New York, substructure, East Chester Creek bridge.

150 Tons, Northampton, Mass., pumping station.

SOUTH AND CENTRAL

1050 Tons, Chicago, subway section D-6-E, bids April 18.

337 Tons, McCreary County, Ky., State project No. FAS-428-B-FHF-92-A; bids April 5.

208 Tons, Greenup County, Ky., State project No. FA-201-D2-GS; bids April 5.

WESTERN STATES

4780 Tons, Los Angeles, Los Angeles River improvement (Section V); bids April 29. (Project previously reported; bid date set).

448 Tons, Sacramento, Cal., redeck Yolo Causeway; bids April 17.

350 Tons, Placentia, Cal., Fullerton Dam; bids April 25. (Project previously reported; bid date set).

154 Tons, Ignacio, Colo., Pine River project (Invitation 32194-A); bids April 4.

105 Tons, Albany, Cal., high school addition; P. Sartorio, San Francisco, general contractor.

100 Tons, Deer Creek, Utah, Provo River project (Invitation 27672); bids in.

. . . NON-FERROUS . . .

. . . Uncertainty dominates all non-ferrous markets . . . Lead lowered $3 a ton . . . Spelter price sentiment on soft side . . . Resale copper concessions still available.

NEW YORK, April 2—Uncertainty over the future trend of affairs both in Europe and the United States continues to restrict buying of non-ferrous metals. This extended lack of demand found reflection last week in two reductions, totaling $3 a ton in lead prices, further concessions in resale copper prices and suggestions of developing weakness in spelter quotations. Domestic copper sales by producers averaged around 500 tons daily in the past week, with the entire month's sales amounting to only 19,700 tons. In February, sales were 147,000 tons. Light export inquiry was in evidence all week and sales were made at prices ranging between 11.10c. and 11.20c., f.a.s., for nearby shipment. The lower level generally ruled on the small business booked in the first two days of the present week. Producers continue to quote 11.50c. per lb., Valley delivery, for domestic shipment, while smelters appear to be conducting business on a basis of 11.25c. per lb., with reports of some sales at 11.20c. gaining credence.

Lead

Another week of poor demand brought two reductions totaling $3 a ton, bringing prices down to a basis of 5.00c. per lb., New York. Statistically, the market appears to be in a healthy condition, but the dearth of orders continues to force the custom smelters to lower levels. The last three price reductions were inaugurated by the smelting interests and followed later by the producers. It is expected that a few more weeks of dullness are still in prospect as users slowly digest the heavy February purchases. April requirements are estimated to be 70 per cent covered.

Zinc

Prime Western sales showed a little improvement in the past week, but were still far below the level necessary to assure stability to the present price of 6.14c. per lb., New York. While all factors would seem to indicate a revival in buying imminent, the longer this movement is delayed, the more uncertain the present price level appears. The week's sales of prime Western metal amounted to 1515 tons, of which 247 tons were at the market level and the balance on an average price basis. Shipments gained slightly in the week to 4200 tons and backlogs now stand at 29,644 tons.

Tin

Heavy liquidating in the Far East in an effort to avoid a new sales tax which became effective Monday drove prices there down sharply in the past week. Cessation of this selling today brought a jump of £8 eastern price and a reversal of the downward trend of domestic prices. Prices here, influenced by the situation in the East, moved downward all last week, and a moderate amount of consumer buying was done on each decline. Prompt Straits today is quoted at 45.876c. per lb., New York, as compared with 44.75c. on Monday and 46c. on Tuesday a week ago. Cash standards in London today were priced at £248 15s.

NON-FERROUS PRICES

Cents per lb. for early delivery

	Mar. 27	Mar. 28	Mar. 29	Mar. 30	Apr. 1	Apr. 2
Copper, Electrolytic[1]	11.50	11.50	11.50	11.50	11.50	11.50
Copper, Lake	11.50	11.50	11.50	11.50	11.50	11.50
Tin, Straits, New York	46.625	45.80	45.625	....	44.75	45.875
Zinc, East St. Louis[2]	5.75	5.75	5.75	5.75	5.75	5.75
Lead, St. Louis[3]	4.90	4.90	4.90	4.90	4.90	4.85

[1] Delivered Conn. Valley. Deduct ¼c. for New York delivery. [2] Add 0.39c. for New York delivery. [3] Add 0.15c. for New York delivery.

Warehouse Prices

Cents per lb., Delivered

	New York	Cleveland
Tin, Straits, pig	47.00c.	47.75c.
Copper, Lake	13.25c.	12.625c.
Copper, electro	12.75c.	12.625c.
Copper, castings	12.375c.	12.375c.
*Copper sheets, hot-rolled	20.12c.	20.12c.
*Yellow brass sheets	18.31c.	18.31c.
*Seamless brass tubes	21.06c.	21.06c.
*Seamless copper tubes	20.62c.	20.62c.
*Yellow brass rods	14.26c.	14.26c.
Zinc slabs	7.10c.	7.75c.
Zinc sheets, No. 9 casks	12.00c.	13.35c.
Lead, American pig	6.00c.	5.50c.
Lead, bar	7.95c.	8.25c.
Lead, sheets, cut	8.50c.	8.25c.
Antimony, Asiatic	16.00c.	17.00c.
Alum., virgin, 99 per cent plus	20.50c.	21.50c.
Alum., No. 1 remelt., 98 to 99 per cent	18.00c.	18.50c.
Solder, ½ and ½	29.25c.	29.00c.
Babbitt metal, anti-friction grade	19.85c.	19.00c.

*These prices, which are also for delivery from Chicago warehouses, are quoted with the following percentages allowed off for extras: on copper sheets, 33⅓; on brass sheets and rods, 40; on brass tubes, 33⅓, and copper tubes, 40.

Old Metals

Cents per lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators. Selling prices are those charged to consumers after the metal has been prepared for their uses.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	9.25c.	9.875c.
Copper, hvy. and wire	8.25c.	8.625c.
Copper, light and bottoms	7.25c.	7.75c.
Brass, heavy	5.00c.	5.50c.
Brass, light	4.125c.	4.875c.
Heavy machine composition	7.75c.	8.375c.
No. 1 yel. brass turnings	4.75c.	5.75c.
No. 1 red brass or compos. turnings	7.25c.	8.75c.
Lead, heavy	4.00c.	7.375c.
Cast aluminum	7.75c.	8.75c.
Sheet aluminum	13.00c.	14.00c.
Zinc	2.75c.	4.00c.

Miscellaneous Non-Ferrous Prices

ALUMINUM, delivered: virgin, 99 per cent plus, 19c.-20c. a lb.; No. 12 remelt No. 2 standard, 18c.-19c. a lb. NICKEL, electrolytic, 35c.-36c. a lb. base refinery, lots of 2 tons or more. ANTIMONY, prompt: Asiatic, 16.50c. a lb., New York; American, 13c. a lb., f.o.b. smelter. QUICKSILVER, $183 per flask of 76 lb. BRASS INGOTS, commercial 85-5-5-5, 11.75c. a lb.

G-M Studies Retirement Plan For Men Earning Over $3000

DETROIT—A proposal for an employees' contributory retirement plan was transmitted Monday to General Motors Corp. stockholders by Alfred P. Sloan, Jr., chairman. The plan provides that employees between the ages 40 and 55 will be given an opportunity to begin contributions toward retirement income based on the amount of their salaries above the Federal Social Security Act maximum. Employee contributions of 5 per cent of salary in excess of $250 per month will be required. The corporation will contribute the balance of costs necessary to provide retirement benefits equal to 1½ per cent of the amount of average monthly salary which is in excess of $250 per month during participation in the plan times the number of years that the employee has contributed.

IRON AND STEEL SCRAP

. . . Weakness at Pittsburgh and easier situation at Chicago force composite down 21c. to $16.08.

APRIL 2.—Except for some bullish sentiment among Detroit brokers, markets are at a standstill or weaker. Little mill buying has taken place, but where it has the net result has been to depress prices. A drop of 50c. in many quotations is warranted by recent sales at Pittsburgh, and a 5000-ton sale into consumption at St. Louis was 25c. under last week's market. Based on broker offers and the last mill sale, the average price of No. 1 steel at Chicago has declined 12½c. Chief grades at Cleveland are off 50c., due largely to general weakness than to any specific transactions, and at Youngstown quotations are nominally down 75c. largely as a result of influences at Cleveland and Pittsburgh both this week and last. All three points await bids on April railroad lists to clarify matters. At Philadelphia, absence of large dealer stocks is lending some firmness to the market and prices are unchanged generally. The net result of the price moves mentioned has been to force the composite down 21c. to $16.08, just half the total decline during the month of March and $1.59 under the figure of $17.67 prevailing during the first three weeks of January.

Bullish sentiment in Detroit is largely accounted for by a contemplated move on the part of the Ford Motor Co. to buy open-hearth material on the open market. Heretofore Ford has sold its excess scrap, chiefly short shovel turnings, on the market.

Chicago

Though as of Tuesday the leading buyer here could purchase heavy melting steel at $15.25 a gross ton delivered, it had not done so, the top range remaining at $15.50, marking the last official purchase price. Brokers can buy freely from dealers for $15.25, but many are offering $15 and a few stray cars have been secured at that level, so the lower range of the Chicago price is being dropped to $15.

Philadelphia

Outside of a few minor downward revisions in quotations on turnings and blast furnace material, and a correction in the quotation on No. 2 steel, market conditions here are little changed from a week ago. Mill purchases are still very scarce, but the absence of large dealer stocks is giving the market a firm undertone. Shipments are being made in several directions against orders placed when No. 1 steel prices were around $18 to $18.50. Demand for cast items, from both foundry and steel mill, continues strong.

Pittsburgh

Open weather, leveling off in operating rates, some suspension on shipments, and general disinterest on the part of consumers have caused a markdown in most scrap grades this week. No. 1 heavy melting steel has been sold into consumption the past week at $16 and $16.50 a ton and is quoted this week at that range, representing a decline of 50c. from a week ago. Railroad heavy melting is nominally quoted at $17 to $17.50, buyers refusing to pay above the top range. This condition is reported to have resulted in the heavy melting steel on the B. & O. list going for export. Railroad scrap rails are quoted nominally at $17.50 to $18, although foundries at points outside of this district are paying higher prices and are cutting them up into short rails. Further clarification is expected when other railroad lists close this week.

Youngstown

No. 1 heavy melting steel this week is revised downward 75c. a ton to $16 to $16.50, all quotations remaining nominal. Local dealers are quite surprised at the trend but scrap is definitely weaker due to weakness at Pittsburgh and Cleveland. While mills at present do not need much scrap, as their business improves the market here should rebound quickly.

Cleveland

No. 1 heavy melting steel and allied grades are quoted down 50c. a ton this week to a range of $15.50 to $16, although prices are nominal. General weakness rather than any specific transaction has made the lower quotations advisable. As small amounts of borings and turnings recently were sold for around $10 per ton, these grades are unchanged.

Buffalo

Continuing almost unchanged from last week, the market has seen no significant transactions. More scrap has been coming out with the advent of better weather. Additional reductions in mill operations have made immediate sales even more problematical. No. 1 heavy melting steel continues to be quoted at $16 to $16.50.

St. Louis

An East Side mill bought 5000 tons of No. 1 heavy melting steel at a decline of 25c. a ton from last week, which affected other prices. The sale was made by four dealers for delivery within 60 days. Dealers here say that country dealers are averse to selling at present prices. Railroad lists: Chicago, Burlington & Quincy, 2300 tons; New York, Chicago & St. Louis, 1600 tons, and St. Louis Southwestern, 300 tons.

Cincinnati

The scrap market is unchanged. Consumer apathy tends to weaken the undertone, but bids are being sustained by refusal of producers to accept lower prices for available material. Country collections are light because of this and the bad weather.

Birmingham

The scrap market here has weakened and indications point to a reduction in the price of No. 1 cast of about 50c. Dealers have no explanation other than bad weather holding up activities and the lack of bottoms for overseas shipments. Pipe plants are operating only three days per week.

Detroit

Bullish sentiment prevails in the broker-dominated part of the market in Detroit, but there is little enthusiasm elsewhere. However, scrap shipments which were held up because of track congestion at the local mill were released the first of the month. Part of the bullishness is based on slightly better prices which were reported bid on plant lists for April accumulations. At the same time Ford is reported to be about to buy open-hearth material in the open market. Knowledge of the probability of the buy is cause for more than half the current excitement. Dealers are getting $13.75 per ton for No. 1 heavy melting steel, delivered, which would justify only the current quotations of $12.50 to $13. Blast furnace grades in general are a little stronger, and bundles have brought a shade over the current quotations from brokers.

New York

Exporters dropped their buying prices 50c. on Nos. 1 and 2 steel delivered to barges in conformance with the continued downward trend in THE IRON AGE composite price. In recent months, however, it has not been possible to keep buying prices in step with the composite trend and at the same time keep the necessary flow of material to barges, with the result that the profit margin has been narrowed considerably.

Boston

Brokers are buying an occasional car of steel turnings at $4.15 a ton on cars for shipment to Coatesville, and bundled skeleton at $8.25 and $8.40 a ton on cars for shipment to two Pennsylvania points. Otherwise the domestic market is bogged down and entirely lacking in feature. Final March quotations showed a net loss of $1 a ton in steel turnings for the month, $1.60 a ton in blast furnace material, and 50c. a ton in bundled skeleton.

Toronto

While business continued somewhat dull in the scrap markets for the week, local dealers state that inquiries are good and offerings are beginning to improve. Yard stocks still are sufficient to meet most of the spot demand and with the prospective new supply from northern Ontario, it is not expected there will be any scarcity of scrap for some time. Prices remain firm without change for the week. Consumers continue to show interest in the market and there is good demand for both steel and iron scrap.

Iron and Steel Scrap Prices

PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$16.00 to $16.50
Railroad heavy melting	17.00 to 17.50
No. 2 heavy melting..	14.50 to 15.00
Railroad scrap rails...	17.50 to 18.00
Rails 3 ft. and under...	20.00 to 20.50
Comp. sheet steel	16.00 to 16.50
Hand bundled sheets..	15.00 to 15.50
Heavy steel axle turn.	14.00 to 14.50
Machine shop turnings	10.00 to 10.50
Short. shov. turnings..	11.50 to 12.00
Mixed bor. & turn....	8.75 to 9.25
Cast iron borings	8.75 to 9.25
Cast iron carwheels ..	18.50 to 19.00
Heavy breakable cast.	15.00 to 15.50
No. 1 cupola cast	17.50 to 18.00
RR. knuckles & coup..	20.00 to 20.50
Rail coil springs.....	20.00 to 20.50
Rail leaf springs.....	20.00 to 20.50
Rolled steel wheels ...	20.00 to 20.50
Low phos. billet crops.	20.00 to 21.00
Low phos. punchings..	20.00 to 20.50
Low phos. heavy plate.	19.50 to 20.00
Railroad malleable	21.00 to 21.50

PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$16.50 to $17.00
No. 2 hvy. mltng. steel.	15.50 to 16.00*
Hydraulic bund., new.	16.50 to 17.00
Hydraulic bund., old..	14.00 to 14.50
Steel rails for rolling..	20.50 to 21.00
Cast iron carwheels...	20.00 to 20.50
Hvy. breakable cast...	.... 18.50
No. 1 cupola cast	20.00 to 20.50
Mixed yard (f'd'y) cast	.... 16.50
Stove plate (steel wks.)	15.00 to 15.50
Railroad malleable ...	21.00 to 22.00
Machine shop turn....	9.50 to 10.00
No. 1 blast furnace...	9.00 to 9.50
Cast borings	10.50 to 11.00
Heavy axle turnings...	14.00 to 14.50
No. 1 low phos. hvy...	21.00 to 21.50
Couplers & knuckles ..	21.00 to 21.50
Rolled steel wheels ...	21.00 to 21.50
Steel axles	21.50 to 22.00
Shafting	22.00 to 22.50
Spec. iron & steel pipe	16.00 to 16.50
Cast borings (chem.)..	14.00 to 14.50

* Quotation of March 28 corrected to this figure also.

CHICAGO

Delivered to Chicago district consumers:

	Per Gross Ton
Hvy. mltng. steel	$15.00 to $15.50
Auto. hvy. mltng. steel alloy free	14.00 to 14.50
No. 2 auto steel	12.25 to 12.75
Shoveling steel	15.00 to 15.50
Factory bundles	14.50 to 15.00
Dealers' bundles	13.00 to 13.50
No. 1 busheling	14.00 to 14.50
No. 2 busheling, old...	5.25 to 5.75
Rolled carwheels	17.50 to 18.00
Railroad tires, cut	17.75 to 18.25
Railroad leaf springs..	17.25 to 17.75
Steel coup. & knuckles.	17.25 to 17.75
Axle turnings	14.00 to 14.50
Coil springs	18.25 to 18.75
Axle turn. (elec.)	15.75 to 16.25
Low phos. punchings..	17.50 to 18.00
Low phos. plates 12 in. and under	17.00 to 17.50
Cast iron borings	8.50 to 9.00
Short shov. turn.	9.00 to 9.50
Machine shop turn.....	8.25 to 8.75
Rerolling rails	17.75 to 18.25
Steel rails under 3 ft..	17.00 to 17.50
Steel rails under 2 ft..	18.00 to 18.50
Angle bars, steel	17.25 to 17.75
Cast iron carwheels ...	16.50 to 17.00
Railroad malleable	17.75 to 18.25
Agric. malleable	13.75 to 14.25
	Per Net Ton
Iron car axles	21.00 to 21.50
Steel car axles	19.75 to 20.25
Locomotive tires	13.75 to 14.25
Pipes and flues	10.25 to 10.75
No. 1 machinery cast..	13.00 to 13.50
Clean auto. cast	13.25 to 13.75
No. 1 railroad cast ...	12.75 to 13.25
No. 1 agric. cast.....	11.50 to 12.00
Stove plate	8.25 to 8.75
Grate bars	9.00 to 9.50
Brake shoes	10.00 to 10.50

YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel.	$16.00 to $16.50
No. 2 hvy. mltng. steel.	15.00 to 15.50
Low phos. plate	19.00 to 19.50
No. 1 busheling	15.25 to 15.75
Hydraulic bundles	15.50 to 16.00
Machine shop turn.....	10.00 to 10.50

CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel.	$15.50 to $16.00
No. 2 hvy. mltng. steel.	14.50 to 15.00
Comp. sheet steel	15.00 to 15.50
Light bund. stampings	12.50 to 13.00
Drop forge flashings...	13.50 to 14.00
Machine shop turn.....	8.50 to 9.00
Short shov. turn.	9.50 to 10.00
No. 1 busheling	14.25 to 14.75
Steel axle turnings....	13.50 to 14.00
Low phos. billet and bloom crops	20.50 to 21.00
Cast iron borings	9.50 to 10.00
Mixed bor. & turn....	9.50 to 10.00
No. 2 busheling	9.50 to 10.00
No. 1 cupola cast.	16.50 to 17.00
Railroad grate bars...	13.00 to 13.50
Stove plate	13.00 to 13.50
Rails under 3 ft.	20.00 to 20.50
Rails for rolling	19.50 to 20.00
Railroad malleable ...	19.00 to 19.50

BUFFALO

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel.	$16.00 to $16.50
No. 2 hvy. mltng. steel.	14.50 to 15.00
Scrap rails	17.00 to 17.50
New hvy. b'ndled sheets	14.50 to 15.00
Old hydraul. bundles..	12.50 to 13.00
Drop forge flashings...	14.00 to 14.50
No. 1 busheling	14.00 to 14.50
Machine shop turn....	9.50 to 10.00
Shov. turnings	12.50 to 13.00
Mixed bor. & turn.....	10.00 to 10.50
Cast iron borings	10.00 to 10.50
Knuckles & couplers..	20.00 to 21.00
Coil & leaf springs....	20.00 to 21.00
Rolled steel wheels ...	20.00 to 21.00
No. 1 machinery cast..	17.50 to 18.00
No. 1 cupola cast.....	16.50 to 17.00
Stove plate	14.50 to 15.00
Steel rails under 3 ft...	21.50 to 22.00
Cast iron carwheels...	17.50 to 18.00
Railroad malleable ...	19.00 to 19.50

ST. LOUIS

Dealers' buying prices per gross ton delivered to consumer:

Selected hvy. melting.	$14.50 to $15.00
No. 1 hvy. melting....	14.00 to 14.50
No. 2 hvy. melting....	12.75 to 13.25
No. 1 locomotive tires.	15.25 to 15.75
Misc. stand. sec. rails.	15.25 to 15.75
Railroad springs	16.00 to 16.50
Bundled sheets	9.00 to 9.50
No. 1 busheling	13.00 to 13.50
Cast bor. & turn.....	5.25 to 5.75
Machine shop turn....	6.25 to 6.75
Heavy turnings	9.25 to 9.75
Rails for rolling	17.00 to 17.50
Steel car axles	18.00 to 18.50
No. 1 RR wrought....	10.50 to 11.00
No. 2 RR wrought....	12.75 to 13.25
Steel rails under 3 ft..	18.00 to 18.50
Steel angle bars	15.00 to 15.50
Cast iron carwheels..	15.50 to 16.00
No. 1 machinery cast..	16.00 to 16.50
Railroad malleable ...	15.75 to 16.25
Breakable cast	14.00 to 14.50
Stove plate	10.75 to 11.25
Grate bars	10.00 to 10.50
Brake shoes	11.00 to 11.50

CINCINNATI

Dealers' buying prices per gross ton at yards:

No. 1 hvy. mltng. steel.	$12.50 to $13.00
No. 2 hvy. mltng. steel.	10.50 to 11.00
Scrap rails for mltng..	17.00 to 17.50
Loose sheet clippings.	8.00 to 8.50
Hydrau. b'ndled sheets	12.00 to 12.50
Cast iron borings	3.75 to 4.25
Machine shop turn....	5.00 to 5.25
No. 1 busheling	9.00 to 9.50
No. 2 busheling	3.00 to 3.25
Rails for rolling	18.50 to 19.00
No. 1 locomotive tires.	14.00 to 14.50
Short rails	19.00 to 19.50
Cast iron carwheels...	14.50 to 15.00
No. 1 machinery cast..	16.00 to 16.50
No. 1 railroad cast.....	14.00 to 14.50
Burnt cast	7.75 to 8.25
Stove plate	7.75 to 8.25
Agricul. malleable	12.50 to 13.00
Railroad malleable	15.50 to 16.00
Mixed hvy. cast.	13.50 to 14.00

BIRMINGHAM

Per gross ton delivered to consumer:

No. 1 hvy. melting steel	$15.00
No. 2 hvy. melting steel	14.00
No. 1 busheling	14.00
Scrap steel rails	15.00
Steel rails under 3 ft...	16.00
Rails for rolling	16.50
Long turnings	5.00
Cast iron borings	7.50
Stove plate	10.00
Steel axles	18.00
No. 1 RR wrought.....	14.00
No. 1 cast	$16.00
No. 2 cast	12.50
Cast iron carwheels	13.00
Steel car wheels	16.00

DETROIT

Dealers' buying prices per gross ton:

No. 1 hvy. mltng. industrial steel	$12.50 to $13.00
No. 2 hvy. mltng. steel.	11.50 to 12.00
Borings and turnings.	6.75 to 7.25
Long turnings	7.25 to 7.75
Short shov. turnings..	8.25 to 8.75
No. 1 machinery cast..	15.50 to 16.00
Automotive cast	16.25 to 16.75
Hvy. breakable cast...	13.00 to 13.50
Stove plate	9.25 to 9.75
Hydraul. comp. sheets.	13.75 to 14.25
New factory bushel....	12.00 to 12.50
Sheet clippings	8.50 to 9.50
Flashings	12.00 to 12.50
Low phos. plate scrap.	13.75 to 14.25

NEW YORK

Dealers' buying prices per gross ton on cars:

No. 1 hvy. mltng. steel.	$12.50 to $13.00
No. 2 hvy. mltng. steel.	11.00 to 11.50
Hvy. breakable cast...	14.00 to 14.50
No. 1 machinery cast.	16.00 to 16.50
No. 2 cast	12.50 to 13.00
Stove plate	10.50 to 11.00
Steel car axles	19.00 to 20.00
Shafting	19.00 to 20.00
No. 1 RR. wrought....	14.00 to 15.00
No. 1 wrought long....	12.50 to 13.00
Spec. iron & steel pipe	13.50 to 14.00
Rails for rolling	15.50 to 16.00
Clean steel turnings*..	5.00 to 5.50
Cast borings*	5.00 to 5.50
No. 1 blast furnace....	5.00 to 5.50
Cast borings (chem.)..	Nominal
Unprepared yard scrap	6.50 to 7.00
Light iron	4.50 to 5.00
Per gross ton delivered local foundries:	
No. 1 machin. cast.....	$17.00 to $18.50
No. 2 cast	16.50 to 17.00

* $1.50 less for truck loads.

BOSTON

Dealers' buying prices per gross ton:

Breakable cast	$12.75 to $13.00
Machine shop turn.....	4.15
Mixed bor. & turn.....	3.15
Bun. skeleton long....	8.25 to 8.40
Shafting	17.00 to 17.25
Stove plate	9.75 to 10.00
Cast bor. chemical	8.00 to 8.50
Per gross ton delivered consumers' yards:	
Textile cast	$17.50 to $19.00
No. 1 machine cast....	17.50 to 19.00
Per gross ton delivered dealers' yards:	
No. 1 hvy. mltng. steel.	$13.25
No. 2 steel	12.25

PACIFIC COAST

Per net ton delivered to consumer:

	San Fran.	Los Ang.	Seattle
No. 1 hvy. mltng. steel	$12.00	$12.00	$11.00
No. 2 hvy. mltng. steel	11.00	11.00	10.00
Bundles	10.00	10.00	9.00

CANADA

Dealers' buying prices at these yards, per gross ton:

	Toronto	Montreal
Low phos. steel.....	$11.50	$11.00
No. 1 hvy. mltng. steel.	11.00	10.50
No. 2 hvy. mltng. steel.	9.75	9.25
Mixed dealers steel...	8.75	8.25
Drop forge flashings...	9.75	9.25
New loose clippings...	8.75	8.25
Busheling	6.00	5.50
Scrap pipe	7.75	7.25
Steel turnings	7.25	6.75
Cast borings	6.75	6.25
Machinery cast	17.50	17.00
Dealers' cast	16.50	16.00
Stove plate	12.50	12.00

EXPORT

Dealers' buying prices per gross ton:

New York, truck lots, delivered, barges	
No. 1 hvy. mltng. steel.	$13.50
No. 2 hvy. mltng. steel.	$11.50 to 12.00
No. 2 cast	12.00 to 12.50
Stove plate	10.00 to 10.50
Boston on cars at Army Base or Mystic Wharf	
No. 1 hvy. mltng. steel.	$15.50
No. 2 hvy. mltng. steel.	14.50
Rail (scrap)	$15.50 to 15.75
Stove plate	8.25 to 8.50
Philadelphia, delivered alongside boats, Port Richmond.	
No. 1 hvy. mltng. steel.	$16.00
No. 2 hvy. mltng. steel.	14.75

PRICES ON FINISHED AND SEMI-FINISHED IRON AND STEEL

Steel prices on these pages are base prices only and f.o.b. mill unless otherwise indicated. On some products either quantity deductions or quantity extras apply. In many cases gage, width, cutting, physical, chemical extras, etc., apply to the base price. Actual realized prices to the mill, therefore, are effected by extras, deductions, and in most cases the amount of freight which must be absorbed in order to meet competition

SEMI-FINISHED STEEL

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (Rerolling only). Prices delivered Detroit are $2 higher F.o.b. Duluth, billets only, $2 higher.

	Per Gross Ton
Rerolling	$34.00
Forging quality	40.00

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Points, Md.

	Per Gross Ton
Open hearth or bessemer	$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods
(No. 5 to 9/32 in.)

	Per Lb.
Pittsburgh, Chicago or Cleveland	2.00c.
Worcester, Mass.	2.10c.
Birmingham	2.00c.
San Francisco	2.45c.
Galveston	2.25c.

9/32 in. to 47/64 in. $3 a net ton higher. Quantity extras apply.

SOFT STEEL BARS

	Base per Lb.
Pittsburgh, Chicago, Gary, Cleveland, Buffalo and Birmingham	2.15c.
Detroit, delivered	2.25c.
Duluth	2.25c.
Philadelphia, delivered	2.47c.
New York	2.49c.
On cars dock Gulf ports	2.50c.
On cars dock Pacific ports	2.75c.

RAIL STEEL BARS
(For merchant trade)

Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham	2.05c.
On cars dock Tex. Gulf ports	2.40c.
On cars dock Pacific ports	2.65c.

BILLET STEEL REINFORCING BARS
(Straight lengths as quoted by distributers)

Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Cleveland, Youngstown or Sparrows Pt.	1.70c. to 1.90c.*
Detroit, delivered	1.80c. to 2.00c.*
On cars dock Tex. Gulf ports	2.20c. to 2.25c.*
On cars dock Pacific ports	2.20c. to 2.25c.*

RAIL STEEL REINFORCING BARS
(Straight lengths as quoted by distributers)

Pittsburgh, Chicago, Gary, Buffalo, Cleveland, Youngstown or Birmingham	1.70c. to 1.90c.*
Detroit, delivered	1.80c. to 2.00c.*
On cars dock Tex. Gulf ports	2.20c. to 2.25c.*
On cars dock Pacific ports	2.20c. to 2.25c.*

* The so-called published price on new billet reinforcing bars is 2.15c. a lb. f.o.b. major basing points and on rail reinforcing bars is 2.00c. a lb. The price range shown above however represents the going prices at the present time.

IRON BARS

Chicago	2.25c.
Pittsburgh (refined)	3.75c.

COLD FINISHED BARS AND SHAFTING*

Pittsburgh, Buffalo, Cleveland, Chicago, and Gary	2.65c.
Detroit	2.70c.

* In quantities of 20,000 to 39,999 lb.

PLATES

	Base per Lb.
Pittsburgh, Chicago, Gary, Birmingham, Sparrows Point, Cleveland, Youngstown, Coatesville, Claymont, Del.	2.10c.
Philadelphia, del'd	2.15c.
New York, del'd	2.29c.
On cars dock Gulf ports	2.45c.
On cars dock Pacific ports	2.60c.
Wrought iron plates, P'tg	3.80c.

FLOOR PLATES

Pittsburgh or Chicago	3.35c.
New York, del'd	3.71c.
On cars dock Gulf ports	3.70c.
On cars dock Pacific ports	3.95c.

STRUCTURAL SHAPES

	Base per Lb.
Pittsburgh, Chicago, Gary, Buffalo, Bethlehem or Birmingham	2.10c.
Philadelphia, del'd	2.215c.
New York, del'd	2.27c.
On cars dock Gulf ports	2.45c.
On cars dock Pacific ports	2.70c.

STEEL SHEET PILING

	Base per Lb.
Pittsburgh, Chicago or Buffalo	2.40c.
On cars dock Gulf ports	2.85c.
On cars dock Pacific ports	2.90c.

RAILS AND TRACK SUPPLIES

F.o.b. Mill

Standard rails, heavier than 60 lb., per gross ton	$40.00
Angle bars, per 100 lb	2.70

F.o.b. Basing Points

Light rails (from billets) per gross ton	$40.00
Light rails (from rail steel) per gross ton	39.00

	Base per Lb.
Cut spikes	3.00c.
Screw spikes	4.55c.
Tie plates, steel	2.15c.
Tie plates, Pacific Coast ports	2.25c.
Track bolts, to steam railroads	4.15c.
Track bolts to jobbers, all sizes (per 100 counts)	65-5

Basing points on light rails are Pittsburgh, Chicago and Birmingham; on spikes and tie plates, Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minneapua, Colo., Birmingham and Pacific Coast ports; on tie plates alone, Steelton, Pa., Buffalo; on spikes alone, Youngstown, Lebanon Pa., Richmond, Va.

SHEETS

Hot Rolled

	Base per Lb.
Pittsburgh, Gary, Birmingham, Buffalo, Sparrows Point, Cleveland, Youngstown, Middletown or Chicago	2.10c.
Detroit, delivered	2.20c.
Philadelphia, delivered	2.27c.
Granite City	2.20c.
On cars dock Pacific ports	2.60c.
Wrought iron, Pittsburgh	4.10c.

Cold Rolled*

Pittsburgh, Gary, Buffalo, Youngstown, Cleveland, Middletown or Chicago	3.05c.
Detroit, delivered	3.15c.
Granite City	3.15c.
Philadelphia, delivered	3.37c.
On cars dock Pacific ports	3.65c.

* Mill run sheets are 10c. per 100 lb. less than base; and primes only, 25c. above base.

Galvanized Sheets, 24 Gage

Pittsburgh, Chicago, Gary, Sparrows Point, Buffalo, Middletown, Youngstown or Birmingham	3.50c.
Philadelphia, delv'd	3.67c.
Granite City	3.60c.
On cars dock Pacific ports	4.00c.
Wrought iron, Pittsburgh	6.10c.

Electrical Sheets
(F.o.b. Pittsburgh)

	Base per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.

Silicon Strip in coils—Sheet price plus silicon sheet extra width extra plus 25c per 100 lb. for coils. Pacific ports add 70c. a 100 lb.

Long Ternes

No. 24 unassorted 8-lb. coating f.o.b. Pittsburgh or Gary	3.80c.
F.o.b. cars dock Pacific ports	4.50c.

Vitreous Enameling Stock, 20 Gage*

Pittsburgh, Chicago, Gary, Youngstown, Middletown or Cleveland	3.35c.
Detroit, delv'd	3.45c.
Granite City	3.45c.
On cars dock Pacific ports	3.95c.

TIN MILL PRODUCTS

Tin Plate

	Per Base Box
Standard cokes, Pittsburgh, Chicago and Gary (100 lb.)	$5.00
Standard cokes, Granite City (100 lb.)	5.10

Special Coated Manufacturing Ternes

	Per Base Box
Granite City	$4.40
Pittsburgh or Gary	4.30

Roofing Terne Plate
(F.o.b. Pittsburgh per Package, 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
20-lb. coating I.C.	7.50	15.00
25-lb. coating I.C.	8.00	16.00
30-lb. coating I.C.	8.63	17.25
40-lb. coating I.C.	9.75	19.50

Black Plate, 29 gage and lighter*

Pittsburgh, Chicago and Gary	3.05c.
Granite City	3.15c.
On cars dock Pacific ports, boxed	4.00c.

* Black plate base price applies to 29 gage within certain width and length limitations.

HOT ROLLED STRIP
(Widths up to 12 in.)

	Base per Lb.
Pittsburgh, Chicago, Gary, Cleveland, Middletown, Youngstown or Birmingham	2.10c.
Detroit, delivered	2.20c.
On cars dock Pacific ports	2.70c.

Cooperage Stock

Pittsburgh & Chicago	2.20c.

COLD ROLLED STRIP*

	Base per Lb.
Pittsburgh, Youngstown or Cleveland	2.80c.
Chicago	2.90c.
Detroit, delivered	2.90c.
Worcester	3.00c.

* Carbon 0.25 and less.

Commodity Cold Rolled Strip

Pittsburgh, Youngstown, or Cleveland	2.95c.
Detroit, delivered	3.05c.
Worcester	3.35c.

COLD ROLLED SPRING STEEL

		Pittsburgh and Cleveland	Worcester
Carbon	0.26-0.50%	2.80c.	3.00c.
Carbon	0.51-0.75	4.30c.	4.50c.
Carbon	0.76-1.00	6.15c.	6.35c.
Carbon	1.01-1.25	8.35c.	8.55c.

WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh, Chicago, Cleveland and Birmingham)

To Manufacturing Trade

	Per Lb.
Bright wire	2.60c.
Galvanized wire, base	2.60c.
Spring wire	3.20c.

To the Trade

	Base per Keg
Standard wire nails	$2.55
Coated nails	2.55
Cut nails, carloads	3.85

	Base per 100 Lb.
Annealed fence wire	$3.05
Woven wire fence, 15½ gage and heavier base col.	67
Fence posts (carloads), base col.	69
Single loop bale ties, base col.	56
Galvanized barbed wire on 80-rod spools (carloads) base col.	70
Twisted barbless wire, base col.	70

Note: Birmingham base same on above items, except spring wire.

STEEL AND WROUGHT IRON PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

F.o.b. Pittsburgh only on wrought iron pipe.

Butt Weld

Steel			*Wrought Iron*		
In.	Black	Galv.	In.	Black	Galv.
⅛	56	36	¼ & ⅜	+9	+30
¼ to ⅜	59	43½	½	24	6½
½	63½	54	¾	30	13
¾	66½	58	1 & 1¼	34	19
1 to 3	68½	60½	1½	38	21½
			2	37½	21

Lap Weld

2	61	52½	2	30½	15
2½ & 3	64	55½	2½ to 3½	31½	17½
3½ to 6.66		57½	4	33½	21
7 & 8.65		55½	4½ to 8.32½		20
9 & 10.64½		55	9 to 12	28½	15
11 & 12.63½		54			

Butt weld, extra strong, plain ends

⅛	54½	41½	¼ & ⅜	+10	+43
¼ to ⅜	56½	45½	½	25	9
½	61½	53½	¾	31	15
¾	65½	57½	1 to 2	38	22½
1 to 3	67	60			

Lap weld, extra strong, plain ends

2	59	51½	2	33½	18½
2½ & 3	63	55½	2½ to 4.39½		25½
3½ to 6.66½		59	4½ to 6.37½		24
7 & 8.65½		56	7 & 8	38½	24½
9 & 10.64½		55	9 to 12	32	20½
11 & 12.63½		54			

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher, on all butt weld 8 in. and smaller.

Boiler Tubes

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes. Minimum Wall. (Net base prices per 100 ft. f.o.b. Pittsburgh in carload lots)

	Seamless Cold Drawn	Seamless Hot Rolled	Lap Weld Hot Rolled
1 in. o.d. 13 B.W.G.	$ 9.01	$ 7.82	....
1¼ in. o.d. 13 B.W.G.	10.67	9.26	....
1½ in. o.d. 13 B.W.G.	11.70	10.23	$9.72
1¾ in. o.d. 13 B.W.G.	13.42	11.64	11.06
2 in. o.d. 13 B.W.G.	15.03	13.04	12.38
2¼ in. o.d. 13 B.W.G.	16.76	14.54	13.79
2½ in. o.d. 12 B.W.G.	18.45	16.01	15.16
2½ in. o.d. 12 B.W.G.	20.21	17.54	16.58
2¾ in. o.d. 12 B.W.G.	21.42	18.59	17.54
3 in. o.d. 12 B.W.G.	22.48	19.50	18.35
3½ in. o.d. 11 B.W.G.	28.37	24.62	23.15
4 in. o.d. 10 B.W.G.	35.20	30.54	28.66
4½ in. o.d. 10 B.W.G.	43.04	37.35	35.22
5 in. o.d. 9 B.W.G.	54.01	46.87	44.25
6 in. o.d. 7 B.W.G.	82.93	71.96	68.14

Extras for less carload quantities:

40,000 lb. or ft. over	Base
30,000 lb. or ft. to 39,999 lb. or ft.	5%
20,000 lb. or ft. to 29,999 lb. or ft.	10%
10,000 lb. or ft. to 19,999 lb. or ft.	20%
5,000 lb. or ft. to 9,999 lb. or ft.	30%
2,000 lb. or ft. to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft.	65%

CAST IRON WATER PIPE

Per Net Ton

*6-in. and larger, del'd Chicago.	$54.80
6-in. and larger, del'd New York	52.20
*6-in. and larger, Birmingham.	46.00
6-in. and larger, f.o.b. dock, San Francisco or Los Angeles or Seattle	56.00
4-in. f.o.b. dock, San Francisco or Los Angeles	59.00
F.o.b. dock, Seattle	52.00

Class "A" and gas pipe, $3 extra 4-in. pipe is $3 a ton above 6-in.

Prices for lots of less than 200 tons. For 200 tons and over, 6-in. and larger is $45. Birmingham, and $53.80 delivered Chicago.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland Birmingham or Chicago)

Per Cent Off List

Machine and carriage bolts:	
½ in. and 6 in. and smaller	68½
Larger and longer up to 1 in.	66
1⅛ in. and larger	64
Lag bolts	66
Plow bolts, Nos. 1, 2, 3, and 7	68½
Hot pressed nuts, and c.p.c. and t-nuts, square or hex. blank or tapped:	
½ in. and smaller	67
9/16 in. to 1 in. inclusive	64
1⅛ in. to 1½ in. incl.	62
1⅝ in. and larger	60

On the above items with the exception of plow bolts, there is an additional allowance of 10 per cent for full container quantities.

On all of the above items there is an additional 5 per cent allowance for carload shipments.

Semi-fin. hexagon nuts	U.S.S.	S.A.E.
½ in. and smaller	67	70
9/16 to 1 in.	64	65
1⅛ in. through 1½ in.	62	62
1⅝ in. and larger	60	60

In full container lots, 10 per cent additional discount.

Stove bolts in packages, with nuts loose	72½
Stove bolts in packages, with nuts attached, add 15% extra.	
Stove bolts in bulk	83½

On stove bolts freight is allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

Large Rivets

(½ in. and larger)

Base per 100 Lb.

F.o.b. Pittsburgh, Cleveland Chicago, Birmingham $3.40

Small Rivets

(7/16 in. and smaller)

Per Cent Off List

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham ... 65 and 10

Cap and Set Screws

(Freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.)

Per Cent Off List

Milled hexagon head, cap screws, 1 in. dia. and smaller	50 and 10
Milled headless set screws, cut thread ¼ in. and larger	64
3/16 in. and smaller	73
Upset hex. head cap screws U.S.S. or S.A.E. thread 1 in. and smaller	70
Upset set screws, cup and oval points	75
Milled studs	52

Alloy Steel

Alloy Steel Blooms, Billets and Slabs

F.o.b. Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem. Base price, $56.00 a gross ton.

Alloy Steel Bars

F.o.b. Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton. Open-hearth grade, base ..... 2.70c.
Delivered, Detroit ..... 2.80c.

S.A.E. Series Numbers	Alloy Differential per 100 Lb.
200 (½% Nickel)	$0.35
2100 (1½% Nickel)	$0.75
2300 (3½% Nickel)	1.55
2500 (5% Nickel)	2.25
31 Nickel-chromium	0.70
3200 Nickel-chromium	1.85
3300 Nickel-chromium	3.80
3400 Nickel-chromium	3.20
4100 Chromium-molybdenum (0.15 to 0.25 Molybdenum)	0.55
4100 Chromium-molybdenum (0.25 to 0.40 Molybdenum)	0.75
4340 Chr.-Ni.-Mo.	1.65
4345 Chro.-Ni.-Mo.	1.85
4600 Nickel - molybdenum (0.20 to 0.30 Mo. 1.50 to 2.00 Ni.)	1.10
5100 Chrome steel (0.60-0.90 Cr.)	0.35
5100 Chrome steel (0.80-1.10 Cr.)	0.45
6100 Chromium spring steel	0.15
6100 Chromium-vanadium bar	1.20
6100 Chromium-vanadium spring steel	0.85
Chromium-nickel vanadium	1.50
Carbon-vanadium	0.85

These prices are for hot-rolled steel bars. The differential for most grades in electric furnace steel is 50c. higher. Slabs with a section area of 16 in. and 2½ in. thick or over take the billet base.

Alloy Cold-Finished Bars

F.o.b. Pittsburgh, Chicago, Gary, Cleveland or Buffalo, 3.35c. base per lb. Delivered Detroit, 3.45c., carlots.

STAINLESS & HEAT RESISTANT ALLOYS

(Base prices, cents per lb. f.o.b. Pittsburgh)

Chrome-Nickel

	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25c.	24c.
Plates	29c.	27c.
Structural shapes	25c.	24c.
Sheets	36c.	34c.
Hot-rolled strip	23.50c.	21.50c.
Cold-rolled strip	30c.	28c.
Drawn wire	25c.	24c.

Straight Chrome

	No. 410	No. 430	No. 442	No. 446
Bars	18.50c.	19c.	22.50c.	27.50c.
Plates	21.50c.	22c.	25.50c.	30.50c.
Sheets	26.50c.	29c.	32.50c.	36.50c.
Hot stp.	17c.	17.50c.	24c.	35c.
Cold stp.	22c.	22.50c.	32c.	52c.

TOOL STEEL

High speed	67c.
High-carbon-chrome	43c.
Oil-hardening	24c.
Special	22c.
Extra	18c.
Regular	14c.

Prices for warehouse distribution to all points on or East of Mississippi River are 2c. a lb. higher. West of Mississippi quotations are 3c a lb. higher.

British and Continental

BRITISH

Per Gross Ton
f.o.b. United Kingdom Ports

Ferromanganese, export	£17 18s.
Tin plate, per base box	32s. to 33s.
Steel bars, open hearth	13£ 9s.
Beams, open hearth	12£ 2s. 6d.
Channels, open hearth	12£ 2s. 6d.
Angles, open hearth	12£ 2s. 6d.
Black sheets, No. 24 gage	17£ max.*; 17£ min.**
Galvanized sheets, No. 24 gage	19£ 10s. max.*; 19£ 10s. min.**

* Empire markets only.
** Other than Empire markets.

CONTINENTAL

Per Gross Ton, Belgian Francs
f.o.b. Continental Ports

Bars, merchant	1500
Plates	1750
Joists	1475
Sheets, thin	1900

Above price are minimum base to which 100 francs should be added to cover war risk insurance, freight charges, etc.

RAW MATERIALS PRICES

PIG IRON

No. 2 Foundry

F.o.b. Everett, Mass.	$24.00
F.o.b. Bethlehem, Birdsboro and Swedeland, Pa., and Sparrows Point, Md.	24.00
Delivered Brooklyn	26.50
Delivered Newark or Jersey City	25.53
Delivered Philadelphia	24.84
F.o.b. Neville Island, Erie, Pa., Toledo, Chicago, Granite City, Cleveland and Youngstown	23.00
F.o.b. Buffalo	23.00
F.o.b. Detroit	23.00
Southern, delivered Cincinnati	23.06
Northern, delivered, Cincinnati	23.44
F.o.b. Duluth	23.50
F.o.b. Provo, Utah	21.00
Delivered, San Francisco, Los Angeles or Seattle	26.50
F.o.b. Birmingham*	19.38

* Delivered prices on southern iron for shipment to northern points are $8c. a ton below del'vered prices from nearest northern basing point on iron with phosphorus content of 0.70 per cent and over.

Malleable

Base prices on malleable iron are 50c. a ton above No. 2 foundry quotations at Everett, Eastern Pennsylvania furnaces, Erie and Buffalo. Elsewhere they are the same, except at Birmingham and Provo, which are not malleable iron basing points.

Basic

F.o.b. Everett, Mass.	$23.50
F.o.b. Bethlehem, Birdsboro, Swedeland and Steelton, Pa., and Sparrows Point, Md.	23.50
F.o.b. Buffalo	22.00
F.o.b. Neville Island, Erie, Pa., Toledo, Chicago, Granite City, Cleveland and Youngstown	22.50
Delivered Philadelphia	24.34
Delivered Canton, Ohio	23.89
Delivered Mansfield, Ohio	24.44
F.o.b. Birmingham	18.00

Bessemer

F.o.b. Buffalo	$24.00
F.o.b. Everett, Mass.	25.00
F.o.b. Bethlehem, Birdsboro and Swedeland, Pa.	25.00
Delivered Newark or Jersey City	26.53
Erie, Pa., and Duluth	24.00
F.o.b. Neville Island, Toledo, Chicago and Youngstown	23.50
F.o.b. Birmingham	24.00
Delivered Cincinnati	24.11
Delivered Canton, Ohio	24.89
Delivered Mansfield, Ohio	25.44

Low Phosphorus

Basing points; Birdsboro, Pa., Steelton, Pa., and Buffalo	$28.50

Gray Forge

Valley or Pittsburgh furnace	$22.50

Charcoal

Lake Superior furnace	$27.00
Delivered Chicago	30.34

Canadian Pig Iron

Per Gross Ton

Montreal

Foundry iron	$27.50 base
Malleable	28.00 base
Basic	27.50 base

Toronto

Foundry Iron	$25.50 base
Malleable	26.00 base
Basic	25.50 base

On all grades 2.25 per cent silicon and under is base. For each 25 points of silicon over 2.25 per cent an extra of 25c. is charged.

FERROALLOYS

Ferromanganese

F.o.b. New York, Philadelphia, Baltimore, Mobile or New Orleans.

Per Gross Ton

Domestic, 80% (carload) $100.00

Spiegeleisen

Per Gross Ton Furnace

Domestic, 19 to 21%	$32.00
Domestic, 26 to 28%	39.50

Electric Ferrosilicon

Per Gross Ton Delivered; Lump Size

50% (carload lots, bulk)	$69.50*
50% (ton lots, packed)	82.00*
75% (carload lots, bulk)	126.00*
75% (ton lots, packed)	142.00*

Bessemer Ferrosilicon

F.o.b. Furnace, Jackson, Ohio

Per Gross Ton

10.00 to 10.50% $32.50

For each additional 0.50% silicon up to 12%, 50c. per ton is added. Above 12% add 75c. per ton.

For each unit of manganese over 2%, $1 per ton additional.

Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Silvery Iron

Per Gross Ton

F.o.b. Jackson, Ohio, 5.00 to 5.50% $27.50

For each additional 0.5% silicon up to 12%, 50c. a ton is added. Above 12% add 75c. a ton.

The lower all-rail delivered price from Jackson or Buffalo is quoted with freight allowed. Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Manganese, each unit over 2%, $1 a ton additional. Phosphorus 0.75% or over, $1 a ton additional.

Ferrochrome

Per Lb. Contained Cr., Delivered Carlots, Lump Size, on Contract

4 to 6% carbon	11.00c.
2% carbon	17.50c.
1% carbon	18.50c.
0.10% carbon	20.50c.
0.06% carbon	21.00c.

Spot prices are ¼c. per lb. of contained chromium higher.

Silico-Manganese

Per Gross Ton, Delivered, Lump Size, Bulk, on Contract

3% carbon	$98.00*
2.50% carbon	103.00*
2% carbon	108.00*
1% carbon	118.00*

Other Ferroalloys

Ferrotungsten, per lb. contained W del., carload	$2.00
Ferrotungsten, 100 lbs. and less	2.25
Ferrovanadium, contract, per lb. contained V., delivered	$2.70 to $2.90†
Ferracolumbium, per lb. contained columbium, f.o.b. Niagara Falls, N. Y., ton lots	$2.25†
Ferrocarbontitanium, 15 to 18% Ti, 7 to 8% C, f.o.b. furnace carload and contract per net ton	$142.50
Ferrocarbontitanium, 17 to 20% Ti, 3 to 5% C, f.o.b. furnace, carload and contract, per net ton	$157.50
Ferrophosphorus, electric, or blast furnace material, in carloads, f.o.b. Anniston, Ala., for 18%, with $3 unitage, freight equalized with Rockdale, Tenn., per gross ton	$58.50
Ferrophosphorus, electrolytic 23-26% in car lots, f.o.b. Monsanto (Siglo), Tenn., 24%, per gross ton, $3 unitage, freight equalized with Nashville	$75.00
Ferromolybdenum, per lb. Mo. f.o.b. furnace	95c.
Calcium molybdate, per lb. Mo. f.o.b. furnace	80c.
Molybdenum oxide briquettes 48-52% Mo. per lb. contained Mo. f.o.b. Langeloth, Pa.	80c.

* Spot prices are $5 per ton higher.
† Spot prices are 10c. per lb. of contained element higher.

*ORES

Lake Superior Ores

Delivered Lower Lake Ports

Per Gross Ton

Old range, bessemer, 51.50%	$5.25
Old range, non-bessemer, 51.50%	5.10
Mesaba, bessemer, 51.50%	5.10
Mesaba, non-bessemer, 51.50%	4.95
High phosphorus, 51.50%	4.85

Foreign Ores*

C.i.f. Philadelphia or Baltimore, Exclusive of Duty

Per Unit

Algerian, low P, Cu free, dry, 55 to 58% Fe	14c.
Swedish, low P, 68% Fe	14c.
Swedish, basic or foundry, 65% Fe	12c
Caucasian, washed, 52% Mn	Nom.
African, Indian, 44 to 48% Mn	46c.
African, Indian, 49 to 51% Mn	49c.
Brazilian, 46 to 48% Mn	47c.
Cuban, del'd, duty free, 51% Mn	62c.

Per Short Ton Unit

Tungsten, Chinese, Wolframite, duty paid, delivered	$23.00 to $23.50
Tungsten, domestic scheelite delivered	23.00 to 23.50
Chrome ore, lump c.i.f. Atlantic Seaboard, per gross ton: South African (low grade)	$19.00
Rhodesian, 45%	22.00
Rhodesian, 48%	26.00 to $27.00
Turkish, 48-49%	29.00 to 30.00
Turkish, 45-46%	Nominal
Turkish, 40-41%	Nominal
Chrome concentrates c.i.f. Atlantic Seaboard, per gross ton: Turkish, 48-49%	Nominal

* All foreign ore prices are nominal.

FLUORSPAR

Per Net Ton

Domestic washed gravel, 85-5, f.o.b. Kentucky and Illinois mines, all rail	$21.00
Domestic, f.o.b. Ohio River landing barges	21.00
No. 2 lump, 85-5, f.o.b. Kentucky and Ill. mines	$20.00 to 22.00
Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic ports, duty paid	$25.00 to $25.50
Domestic No. 1 ground bulk, 96 to 98%, calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines	$31.00
ditto, in bags, f.o.b., same mines	$32.60

FUEL OIL

Per Gal.

No. 3, f.o.b. Bayonne, N. J.	5.10c.
No. 6, f.o.b. Bayonne, N. J.	3.57c.
No. 5 Bur. Stds., del'd Chicago	3.25c.
No. 6 Bur. Stds., del'd Chicago	2.75c.
No. 3 distillate, del'd Cleve'd.	5.25c.
No. 4 industrial, del'd Cleve'd.	5.00c.
No. 5 industrial, del'd Cleve'd.	4.25c.
No. 6 industrial, del'd Cleve'd.	3.875c.

COKE

Per Net Ton

Furnace, f.o.b. Connellsville, Prompt	$4.00 to $4.25
Foundry, f.o.b. Connellsville, Prompt	5.25 to 5.50
Foundry, by - product Chicago ovens	10.50
Foundry, by - product del'd New England	12.50
Foundry, by - product del'd Newark or Jersey City	11.38 to 11.90
Foundry, by - product Philadelphia	11.13
Foundry, by - product delivered Cleveland	11.05
Foundry, by - product delivered Cincinnati	10.50
Foundry, Birmingham	7.50
Foundry, by - product del'd St. Louis industrial district	10.75 to 11.00
Foundry, from Birmingham, f.o.b. cars dock Pacific ports	14.75

IRON AND STEEL WAREHOUSES

PITTSBURGH*

	Base per Lb.
Plates	3.40c.
Shapes	3.40c.
Soft steel bars and small shapes	3.35c.
Reinforcing steel bars	2.70c.
Cold finished bars and screw stock	3.65c.
Hot rolled strip	3.60c.
Hot rolled sheets	3.35c.
Galv. sheets (24 ga.) 500 lb. to 1499 lb.	4.75c.
Wire, black, soft annealed	3.30c.
Wire, galv., soft	3.55c.
Track spikes (1 to 24 kegs)	3.60c.
Wire nails (in 100-lb. kegs)	2.80c.

On plates, structurals, bars, strip and hot rolled sheets, base applied to orders of 400 to 1999 lb.
On reinforcing bars base applies to orders of less than one ton and includes switching and starting charge.
All above prices for delivery within the Pittsburgh switching district.

NEW YORK

	Base per Lb.
*Plates, ¼ in. and heavier	3.76c.
*Structural shapes	3.75c.
*Soft steel bars, round	3.84c.
Iron bars, Swed. charcoal	9.50c.
**Cold-fin. shafting and screw stock:	
Rounds, squares, hexagons	4.09c.
Flats up to 12 in. wide	4.09c.
Cold-rolled strip soft and quarter hard	3.51c.
*Hot-rolled strip, soft O.H.	3.96c.
*Hot-rolled sheets	3.43c.
Galv. sheets (24 ga.)	4.50c.
Cold-rolled sheets (20 ga.)	
Standard quality	4.60c.
Deep drawing	4.85c.
Stretcher leveled	5.10c.
SAE, 2300, hot-rolled	7.35c
SAE, 3100, hot-rolled	5.90c.
SAE, 6100, hot-rolled annealed	8.75c.
SAE, 2300, cold-rolled	8.59c.
SAE, 3100, cold-rolled, annealed	8.19c.
*Floor plate, ⅛ in. and heavier	5.56c.
Standard tool steel	12.50c.
Wire, black, annealed	4.85c
Wire, galv. (No. 9)	4.70c.
O. H. spring steel, flats	4.70c.
Common wire nails, per keg	$2.85

*For lots 400 to 1999 lb.
**For lots less than 1500 lb.

CHICAGO

	Base per Lb.
Plates and structural shapes	3.55c.
Soft steel bars, rounds and angles	3.50c.
Soft steel squares, hexagons, channels and Tees	3.65c.
Hot rolled strip	3.60c.
Floor plates	5.15c.
Hot rolled sheets	3.35c.
Galvanized sheets	4.60c.
Cold rolled sheets	4.30c.
Cold finished carbon bars	3.75c.

Above prices are subject to deductions and extras for quantity and are f.o.b. consumer's plant within Chicago free delivery zone.

CLEVELAND

	Base per Lb.
Plates	3.40c.
Structural shapes	3.58c.
Soft steel bars	3.25c.
Cold-fin. bars (1500 lb., over.)	3.75c.
Hot-rolled strip	3.50c.
Cold rolled sheets	4.05c.
Cold-finished strip	3.20c.
Galvanized sheets (No. 24)	4.72c.
Hot-rolled sheets	3.35c.
Floor plates, 3/16 in. and heavier	5.18c.
Black ann'l'd wire, per 100 lb.	$3.10
No. 9 galv. wire, per 100 lb.	3.50
Com. wire nails, base per keg	2.75
Hot rolled alloy steel (3100)	5.85c.
Cold rolled alloy steel (3115)	6.75c.

Prices shown on hot rolled bars, strip, sheets, shapes and plates are for 400 to 1999 lbs. Alloy steel, 1000 lb. and over; galvanized sheets, 150 to 1499 lb.; cold rolled sheets, 400 to 1499 lb.

ST. LOUIS

	Base per Lb.
Plates and structural shapes	3.47c.
Bars, soft steel (round and flats)	3.62c.
Bars, soft steel (squares, hexagons, ovals, half ovals and half rounds)	3.77c.
Cold fin. rounds, shafting, screw stock	4.02c.
Galv. sheets (24 ga.)	4.52c.
Hot rolled sheets	3.38c.
Galv. corrugated sheets, 24 ga. and heavier*	4.57c.
Structural rivets	5.02c.

* No. 26 and lighter take special prices.

BOSTON

	Base per Lb.
Structural shapes, 3 in. and larger	3.85c.
Plates, ¼ in. and heavier	3.85c.
Bars	3.88c.
Heavy hot rolled sheets	3.71c.
Hot rolled sheets	4.21c.
Hot rolled annealed sheets	4.61c.
Galvanized sheets	4.61c.
Cold rolled sheets	4.71c.

The following quantity differentials apply: Less than 100 lb., plus $1.50 per 100 lb.; 100 to 399 lb. plus 50c.; 400 to 1999 lb. base; 2000 to 9999 lb. minus 20c.; 10,000 to 39,999 lb. minus 30c.; 40,000 lb. and over minus 40c.

BUFFALO

	Base per Lb.
Plates	3.62c.
Floor plates	5.25c.
Struc. shapes	3.40c.
Soft steel bars	3.35c.
Reinforcing bars (20,000 lb. or more)	2.15c.
Cold-fin. flats, squares, rounds, and hex.	3.65c.
Hot-rolled sheets, 3/16 x 14 in. to 48 in. wide incl., also sizes No. 8 to 30 ga.	3.35c.
Galv. sheets (24 ga.)	4.70c.
Bands and hoops	3.82c.

NEW ORLEANS

	Base per Lb.
Mild steel bars	4.20c.
Reinforcing bars	3.24c.
Structural shapes	4.10c.
Plates	4.10c.
Hot-rolled sheets, No. 10	4.35c.
Steel bands	4.75c.
Cold-finished steel bars	5.10c.
Structural rivets	4.85c.
Boiler rivets	4.85c.
Common wire nails, base per keg	3.55
Bolts and nuts, per cent off list	60

REFRACTORIES PRICES

Fire Clay Brick

	Per 1000 f.o.b. Works
Super-duty brick, at St. Louis	$60.80
First quality Pennsylvania, Maryland, Kentucky, Missouri and Illinois	47.50
First quality, New Jersey	52.50
Second quality, Pennsylvania, Maryland, Kentucky, Missouri and Illinois	42.75
Second quality, New Jersey	49.00
No. 1 Ohio	39.90
Ground fire clay, per ton	7.10

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	$47.50
Chicago District	55.10
Birmingham	47.50
Silica cement per net ton (Eastern)	8.55

Chrome Brick

	Net per Ton
Standard f.o.b. Baltimore, Plymouth Meeting and Chester	$50.00
Chemically bonded f.o.b. Baltimore, Plymouth Meeting and Chester, Pa.	50.00

Magnesite Brick

	Net per Ton
Standard f.o.b. Baltimore and Chester	$72.00
Chemically bonded, f.o.b. Baltimore	61.00

Grain Magnesite

	Net per Ton
Imported, f.o.b. Baltimore and Chester, Pa. (in sacks)	(—)*
Domestic, f.o.b. Baltimore and Chester in sacks	40.00
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

* None available.

PHILADELPHIA

	Base per Lb.
*Plates, ¼-in. and heavier	3.55c.
*Structural shapes	3.55c.
*Soft steel bars small shapes, iron bars (except bands)	3.85c.
‡Reinforc. steel bars, square and deformed	2.76c.
Cold-finished steel bars	4.16c.
*Steel hoops	4.35c.
*Steel bands, No. 12 and 3/16 in. incl.	3.85c.
*Spring steel	5.00c.
*Hot-rolled anneal. sheets	3.55c.
†Galvanized sheets (No. 24)	4.75c.
*Diam. pat. floor plates, ¼ in.	5.25c.

*For quantities between 400 and 1999 lb.
†For 10 bundles or over.
‡For one to five tons.

BIRMINGHAM

	Base per Lb.
Bars and bar shapes	3.50c.
Structural shapes and plates	3.55c.
Hot rolled sheets No. 10 ga.	3.35c.
Galvanized sheets No. 24 ga. or more	4.75c.
Strip	3.60c.
Reinforcing bars	3.50c.
Floor plates	5.88
Cold finished bars	4.43
Machine and carriage bolts	50 & 10 off list
Rivets (structural)	$4.60 base

On plates, shapes, bars, hot-rolled strip, heavy hot-rolled sheets, the base applies on 400 to 1999 lb. All prices are f.o.b. consumer plant.

PACIFIC COAST

	Base per Lb. San Francisco	Los Angeles	Seattle
Plates, tanks and U. M.	3.35c.*	3.80c.	3.40c.
Shapes, standard	3.35c.*	3.80c.	3.50c.
Soft steel bars	3.50c.	3.50c.	4.00c.
Reinforcing bars, f.o.b. cars dock Pacific ports	2.525c.	open.	2.975c.
Hot-rolled sheets (No. 10)	3.40c.	4.10c.	3.70c.
Galv. sheets (No. 24 and lighter)	5.15c.	5.00c.	4.75c.
Galv. sheets (No. 22 and heavier)	5.40c.	5.00c.	4.75c.
Cold-finished steel			
Rounds	6.80c.	6.60c.	7.00c.
Squares and hexagons	8.05c.	7.85c.	8.25c.
Flats	8.55c.	8.35c.	8.25c.
Common wire nails—base per keg less carload	3.25c.	3.25c.	3.25c.

* Plates over 1 in. and shapes over 6 in. are 25c. per 100 lb. higher.
All items subject to differentials for quantity.

ST. PAUL

	Base per Lb.
Mild steel bars, rounds	4.10c.
Structural shapes	4.00c.
Plates	4.00c.
Cold-finished bars	4.83c.
Hot-rolled annealed sheets, No. 24	4.75c.
Galvanized sheets, No. 24	5.00c.

On mild steel bars, shapes and plates the base applies on 400 to 14,999 lb. On hot-rolled sheets, galvanized sheets and cold-rolled sheets base applies on 15,000 lb. and over. Base on cold-finished bars is 1000 lb. and over of a size.

DETROIT

	Base per Lb.
Soft steel bars	3.43c.
Structural shapes	3.65c.
Plates	3.60c.
Floor plates	5.27c.
Hot-rolled sheets, 8 to 30 gages above 12 in. and 3/16 in., 24 in. to 48 in. wide	3.43c.
Cold-rolled sheets	4.50c.
*Galvanized sheets	4.84c.
Hot rolled strip, under 12 gage	3.68c.
Hot rolled strip, above 12 gage	3.43c.
Cold-finished bars	3.80c.
Cold-rolled strip	3.40c.
Hot-rolled alloy steel (SAE 3100 Series)	5.97c.
Cold-rolled alloy (SAE 2300)	8.45c.

Quantity extras apply to all items.
*Price applies only in metropolitan Detroit.

Temper Cracks in High Speed Steels

(CONCLUDED FROM PAGE 53)

if a quenched high speed steel, decarburized in its outer layer, be heated to a temperature lower than 500 deg., no abnormal change will occur in the specimen, and when heated above 550 deg. no change will also occur in the heating, but in the course of cooling the inner portion of the steel will show considerable expansion, as indicated in the dilatometric curve, while the outer layer will slowly shrink with the fall of temperature. Hence, this difference of volume between the inner and outer portions results in a large tensional stress in the latter portion, eventually causing the steel to crack at the surface layer.

The degree of the decarburization of the steel may differ with the distance from the surface, and so, as another example, consideration should be given to the results of W. Eilender, H. Klinar and H. Cornelius (Archiv. E. H. W., 1932), whose specimens were very similar except the carbon content was very low; thus, their specimen contained 0.15 per cent C, 3.8 Cr, 18.1 W, 0.55 V, 9.96 Co, and 0.56 per cent Mo. Hardness measurements were made during tempering of the specimen quenched from 1300 deg. A very steep increase of hardness was the result of tempering in the range of 500 deg. to 600 deg.; according to the German investigators, this increase of hardness is due to the hardening effect of precipitated substances, because a magnetic study of the specimens gives no indication of its martensitization in the tempering. Hence, in the case where the decarburized layer is of such a composition as mentioned, cracks will be formed during tempering of a quenched high speed steel.

As previously stated, when the tempering temperature is higher than 650 deg., there appears no crack; this fact may be explained as follows. When the tempering temperature is so high, the decomposition of the retained austenite occurs quite easily during heating, and moreover in such elevated temperatures, steels are obviously softer and deformable under a large stress; hence, cracks cannot occur in the tempering.

The data obtained by this investigation may be summarized as follows:

(1) By quenching a small piece of high speed steel in water or oil from about 1300 deg. C., no cracks occur in the specimen, while quenching in a high temperature bath of 500 deg. to 600 deg. C. cracks often appear.

(2) By tempering a quenched high speed steel in the range of 500 deg. to 650 deg. C., (932 to 1202 deg. F.), tempering cracks appear in the specimen. But if the tempering is made at temperatures lower or higher than this range, cracks do not occur.

(3) When a quenched high speed steel is tempered at about 550 deg. C., the martensitization of the retained austenite takes place in the course of cooling below 300 deg. C.

(4) The decarburized layer of a quenched high speed steel may also be hardened by tempering, but the hardening is simply due to precipitated particles, and hence no marked change of volume during tempering is observable.

(5) The cause of the tempering crack in question may be explained to be the tensional stress induced in the decarburized zone by the martensitization of the retained austenite of the inner portion.

(6) In order to avoid the tempering crack of a high speed steel, the specimen should be free from decarburized zone before tempering.

This Week on the Assembly Line

(CONCLUDED FROM PAGE 59)

so it starts to rewind in the opposite direction on the drum. At this point there is a subtraction of cable speeds and a slowing of the movement of the hook and its load. In other words, one cable winds up while the other unwinds, giving a slow differential or resultant speed. Any ratio or combination of ratios within practical limits can be attained by changing drum sizes. The principle will be remembered by many engineers as a favorite trick used by professors of mathematics or mechanics, demonstrated with spools and thread.

Output Is Steady

Automobile production held steady last week, the output being 103,370 compared with 103,395 in the previous week, according to Ward's Automotive Reports. Assemblies a year ago in the corresponding week totaled 85,980. Among the Big Three, Chevrolet remained steady at 27,000 units, while a Ford-Mercury decline from 22,500 to 20,150 was counterbalanced by a Plymouth gain from 9,350 to 11,575. March sales statistics showed very rapid acceleration in automotive buying. Pontiac, for instance, registered in the first 20 days of the month a gain of 55.7 per cent over the same period of March, 1939, and 46 per cent ahead of the first 20 days of February. Chevrolet measured the gain of the second 10-day period over the first at 23.4 per cent. Cadillac is going 73 per cent better than a year ago, and Buick's second 10-day period is 66 per cent better than last March. These various General Motors statistics are matched by Ford and Mercury, which had a second 10-day period 31 per cent better than a year ago and 47 per cent higher than the total for the mid-period in February.

Business Research Starts

PLANS for organization of a non-profit foundation to do research work in the interests of private business enterprise have been announced by George S. May, Chicago business man. The George S. May Business Foundation has been granted an Illinois charter and will open offices in Chicago and New York. Research engineers will be maintained in eighteen leading American cities.

Subjects slated for early study include: Bonus payment plans for supervisors and executives, modern methods of market analysis, the effect of public opinion on business, and the value of trade associations to business.

THIS WEEK'S MACHINE ...TOOL ACTIVITIES...

...March bookings touched a peak for year at Cincinnati, although export demand tapered at month's end... Big aircraft equipment program still overhangs the market... Automotive plant expansions indicate further machinery purchases... New business being quoted into 1940.

March Bookings Touched High for the Year

CINCINNATI—Recapitulation of March machinery business indicates that bookings touched the year's peak, despite a quieter demand during the past week. The early part of the month was brisker than the latter, although business is still rated good. Domestic ordering has been fairly stable, showing none of the broad fluctuation so apparent in foreign demand. In fact, the slower ordering during the past week was chiefly the result of a decline in export demand. Manufacturers' optimism, however, continues high since inquiry and near-to-closing business is in substantial volume. In fact, several manufacturers report foreign buyers ready to place more business in the immediate future, while domestic users are definitely interested in further retooling. Lathe demand was most noticeably off the past week, other tool types showing either no change or small fluctuations downward.

Much of the new busines is for 1941 delivery since a large part of capacity is nearly sold for the current year. Plants continue to operate at full capacity.

Plant Additions Point To Machinery Buying

DETROIT—Addition of 78,000 sq. ft. of manufacturing space at Chrysler's Highland Park plant, announced late last week, indicates strongly that there will be additional purchases of press shop equipment and possibly some other machinery. The building will include a high press bay 75 ft. wide x 268 ft. long. Briggs is installing four or five new press pits in the Mound Road plant, all of a size sufficient to handle major auto body parts. A forge shop, to be devoted entirely to equipment of the heavy forging-press type, is being seriously considered at Oldsmobile but the final decision has not been made. However, it is known that a new plant for this purpose is authorized by GM. Inquiries have been made for considerable equipment, but only to obtain cost information, it is stated. Production of parts for the Olds hydramatic transmission will be an important part of the operations in the new plant, if it is erected.

Also indicative of an important program for buying new equipment is the revelation of plans for a new building, to cost $360,000, to be erected immediately by AC Spark Plug Co. for the manufacture of spark plugs at Flint. The new structure is part of an expansion program which includes alterations in the present plant facilities.

March Ended Up Well For Some N. Y. Dealers

NEW YORK—The base of sales activity has been broadened in the past week, and more dealers and factory representatives are reporting a satisfactory volume than was the case a week ago. For several the month of March ended up with a total volume comparable to recent months and for one limited line, the March volume was almost equal to the combined January and February totals. Yet no large programs have been responsible for this grodual improvement as the month wore on, although certain lines stand out. A local shipyard purchased about a dozen machine tools, antifriction bearing manufacturers have been active in buying, and aircraft parts makers were in the market. The Navy has figured in recent purchases, one of the costliest machines on record—a combination boring and milling machine, sold at $131,000—going to the New York Navy Yard. For the first time, the sale of some machinery has been reported for the manufacture of anti-aircraft shells on a production basis for a foreign power.

Up to the end of last week, the leading aircraft engine builders in the East had failed to take action in connection with the impending huge aircraft orders from the Allies. Committees of both houses of Congress have approved the Administration policy of permitting the British and the French to use the latest Army designs of war planes, and it seems only a matter of days before the plane and engine orders come through. Tentative orders for machine tools have been issued and confirmais awaited. The total volume will run over $10,000,000 from concerns in this territory alone. Some machine tool builders have reserved space in their schedules in the last quarter of this year to produce this machinery for the aircraft industry.

Order Level Holds; Volume Of Inquiries High

CHICAGO—Current order and inquiry volume is little changed from a week ago. Outstanding quotations are numerous and a continuation of recent activity is being predicted. Over two-thirds of the equipment for Kearney & Trecker's new addition has been installed and some departments are already operating in the new structure. Some time will elapse, however, before the plant rearrangement is complete.

A revision in the Illinois Occupational Retailers' tax by which the 3 per cent levy is applied to interstate commerce as well as to intrastate transactions is causing Chicago machine tool sellers some concern. The tax is being added to the selling price of the machines at present, but dealers are seeking a clarification of their position with reference to out-of-state customers.

...PIPE LINES...

Southern California Gas Co., 810 South Flower Street, Los Angeles, is arranging fund of about $6,000,000 for expansion and improvements in properties during 1940, including pipe line extensions and replacements, new main pressure lines, plant expansion and improvements, booster stations, service installations and other facilities.

Texas Cities Gas Co., Galveston, Tex., will begin work soon on extensions in 6-in. steel pipe line system for natural gas transmission, about four miles; also several miles of smaller pipe in distributing system, with service facilities. Cost close to $75,000. Plans are under way for installation of about 14,800 ft. of 8-in. steel pipe across Galveston Bay for replacement of an existing pipe line, about 9800 ft. long, and on mainland opposite Galveston Island, about 5000 ft. Cost close to $60,000.

Bureau of Yards and Docks, Navy Department, Washington, closes bids April 10 for oil and steam pipe line systems at Naval Air Station, Jacksonville, Fla., including fuel oil tank, pumping equipment and accessories (Specifications 9518).

Stanolind Pipe Line Co., Tulsa, Okla., has let contract to Gorden Construction Co., Denver, and Fredell Construction Co., Houston, Tex., for new welded steel pipe line from point in Ellis County, Kan., to Washington, Kan., about 134 miles, for oil transmission. Connection will be made at last noted point with main Wyoming-Missouri pipe line system of company. Cost about $1,350,000 with pumping stations and other operating facilities.

Hunt Oil Co., Tucker, near Palestine, Tex., plans pressure pipe lines in connection with new recycling plant in Long Lake, Tex., oil field for gas transmission to plant, work on which will begin at once. Entire project will cost close to $300,000.

Bureau of Reclamation, Denver, has awarded contract to Provo Foundry & Machine Co., Provo, Utah, at $23,850 for steel pipe for by-pass and air inlet piping system for main unit penstocks at Shasta Dam, Central Valley project, Cal., including fittings and accessories (Specifications 1330-D).

Empire Gas & Fuel Co., Wellsville, N. Y., plans pressure pipe lines in connection with development of new gas wells in Allegany County fields, where drilling operations will begin soon, including booster stations and other facilities.

Constructing Quartermaster, Northeast Air Base, Chicopee Falls, Mass., asks bids until April 9 for welded steel pipe; also for galvanized malleable iron pipe, cast iron pipe and fittings, nipples, unions, etc. (Circular 6905-19).

Natural Gas Corp. of Tennessee, Chattanooga, care of L. N. Spears, Chattanooga, attorney and representative, now being organized, plans welded steel pipe line from gas field near Minden, La., to Chattanooga, more than 550 miles, for natural gas transmission. Branch pipe lines are planned to Nashville and Knoxville, Tenn. Company proposes to furnish natural gas to industrial plants in these areas at wholesale rates. T. H. McMillan, Chattanooga, commissioner of education, and Wallace Edwards, Nashville, former State administration commissioner, are interested in project, which will be headed by V. S. Johnson, Chicago, and associates, gas utility operators.

PLANT EXPANSION AND EQUIPMENT BUYING

NORTH ATLANTIC

Continental Can Co., 100 East Forty-second Street, New York, plans one-story addition, 125 x 200 ft., to branch plant at Syracuse, N. Y. Cost over $80,000 with equipment.

Faber Iron Works, 529 Hudson Street, New York, fire escapes, iron treads and kindred products, has acquired building at 311 West Seventeenth Street for plant.

Port Quartermaster, Port of Embarkation, Army Base, Fifty-eighth Street and First Avenue, Brooklyn, asks bids until April 8 for elevator parts, including mechanical lock rollers, bolts, cotter pins, rivets, iron wire, sheaves, lubricators, lock springs, etc. (Circular 626-29).

Ranger Engineering Corp., Conklin Street, Farmingdale, L. I., aircraft engines and parts, subsidiary of Fairchild Engine & Airplane Corp., New York, plans two-story addition. Cost close to $85,000 with equipment. Albert Kahn, Inc., New Center Building, Detroit, is architect and engineer.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until April 9 for steel angle and globe valves, welding ends (Schedule 1160); until April 12, steel forgings (Schedule 1206) for Brooklyn and Philadelphia Navy yards; until April 9, 175,000 lb. of steel rivets (Schedule 1187), two centrifugal pumps and spare parts (Schedule 1169 for Philadelphia yard.

Permatex Co., Inc., Avenue Y and East Eighteenth Street, Brooklyn, automobile chemical products, has let general contract to Caye Construction Co., 356 Fulton Street, for three-story addition. Cost about $90,000 with equipment.

American Bamberg Corp., 261 Fifth Avenue, New York, rayon products, plans expansion and improvements in mill at Elizabethton, Tenn., including equipment. Cost about $650,000 with machinery. Work will be carried out as soon as financing has been completed through sale of stock issues.

Signal Corps Procurement District, Army Base, Fifty-eighth Street and First Avenue, Brooklyn, asks bids until April 9 for couplings (Circular 350); until April 15 for power units (Circular 339).

American Locomotive Co., 30 Church Street, New York, plans one-story addition to plant at Schenectady, N. Y., for expansion in diesel locomotive shops. Cost close to $50,000 with equipment.

Quartermaster Supply Officer, Army Base, Fifty-eighth Street and First Avenue, Brooklyn, asks bids until April 9 for galvanized steel strapping (Circular 626-299).

Harnischfeger Corp., Milwaukee, cranes, hoists, derricks, etc., has leased former works of Atlan Steel Co., Lister Avenue and Chapel Street, Newark, N. J., comprising several buildings, totaling 25,000 sq. ft. of floor space, with 2½-acre tract adjoining, for new Eastern branch plant.

Hudson Oil Co., Inc., 254 Doremus Avenue, Newark, N. J., has let general contract to Irons & Reynolds, Inc., 420 Lexington Avenue, New York, for one-story addition for expansion in packing, storage and distribution departments, including dock, 90 x 90 ft., for shipping. Cost over $70,000 with equipment. Lockwood Greene Engineers, Inc., 10 Rockefeller Plaza, New York, is engineer.

Commanding Officer, Ordnance Department, Picatinny Arsenal, near Dover, N. J., asks bids until April 8 for nails (Circular 1298), three compressed air drying systems and two welded fume collectors, with motor, hood, fan, hose, etc. (Circular 1302), two tetryl dryers, truck type (Circular 1276), 78 gate valves, 19 globe valves and three needle valves (Circular 1308).

Sharpe & Flynn, Inc., 4859 Stenton Avenue, Philadelphia, sheet metal products, has purchased one-story building, 20,000 sq. ft. floor space, on Stokley Avenue, near Roberts Street, for plant.

Public Works Officer, Navy Yard, Philadelphia, asks bids until April 10 for 38 monorail cranes, each with one-ton hoist; 13 jib cranes, each with one-ton hoist; and two one and one-half-ton electric cranes respectively (Specifications 9748).

NEW ENGLAND

Lew Mfg. Co., 221 Huntington Avenue, Providence, R. I., automatic metal pencils and other metal specialties, has let general contract to Hope Building Co., Inc., 36 Exchange Place, for two-story addition, 35 x 50 ft. Cost close to $45,000 with equipment. Francis Chiaverine, 32 Broadway, is architect.

Commanding Officer, Ordnance Department, Springfield Armory, Springfield, Mass., asks bids until April 10 for motor-driven drying tumbler, not less than 42 in. diameter and 90 in. long; and centrifugal, motor-driven, under-drive extracting machine (Circular 318); until April 12, multiple-cut woodworking gainer or groover (Circular 321).

Purchasing and Contracting Officer, Quartermaster Corps, Fort Ethan Allen, Vt., asks bids until April 23 for one hydraulic lift, direct plunger-type (Circular 107-23).

Walker Chemical Corp., 171 Westminster Street, Providence, R. I., has approved plans for new plant at Carolina, near Wood River Junction, consisting of seven one-story buildings and a three-story structure. Cost over $60,000 with equipment.

WASHINGTON DIST.

Contracting Officer, Office of Chief of Engineers, Munitions Building, Washington, asks bids until April 18 for one 20-ton, 56½-in. gage, gasoline locomotive for Fort Belvoir, Va. (Circular 141).

Civil Aeronautics Authority, Washington, asks bids until April 12 for 300,000 to 800,000 ft. of three-conductor parkway cable, and 75,000 to 150,000 ft. of two-conductor cable (Circular 376).

Vitagen Corp., Woodward Building, Washington, plans new commercial fertilizer plant near Orlando, Fla., comprising several one-story production units, with all departments mechanized; storage and distributing buildings and other structures. Cost over $200,000 with machinery. V. C. Babcock, engineer for Organo Corp., Orlando, which is interested in project, will be in charge of erection.

General Purchasing Officer, Panama Canal, Washington, asks bids until April 8 for 5000 electric detonators (Schedule 3987); until April 9, 13,000 galvanized malleable iron pipe clamps, wire solder, bronze propellers, cartridge type resistors, etc. (Schedule 3973); until April 11, two portable well-drilling machines and 24 cast steel open wedge sockets (Schedule 3979); until April 12, 100,000 railway tie plates, 7 x 10 in. (Schedule 3993).

American Viscose Corp., Delaware Trust Building, Wilmington, Del., has asked bids on general contract for extensions and improvements in branch mill at Roanoke, Va. Cost over $50,000 with equipment. Ballinger Co., 105 South Twelfth Street, Philadelphia, is architect and engineer.

Commanding Officer, Ordnance Department, Nansemond Ordnance Depot, Portsmouth, Va., asks bids until April 15 for one shot or irregular grit blast cleaning cabinet and dust collector, for renovating 75-mm. common steel shells (Circular 47).

General Purchasing Officer, Panama Canal, Washington, asks bids until April 9 for 985 crucibles without covers (Schedule 1075) for Portsmouth, N. H., Navy Yard; electric cable (Schedule 1165) for Norfolk, Va., yard; until April 12, one gasoline engine industrial tractor (Schedule 1144); until April 16, brass, bronze, copper and steel wire (Schedule 1168), wire rope and seizing strand (Schedule 1164), air hose fittings (Schedule 1153), non-metallic gasoline hose (Schedule 1148) for Eastern and Western yards; bronze fuel oil hose and bronze steam hose (Schedule 1143) for Sewall's Point, Va., and Mare Island yards.

SOUTH ATLANTIC

General Dyestuff Corp., South Boulevard, Charlotte, N. C., dyes and chemicals, plans one-story factory branch, storage and distributing plant on Wilkinson Boulevard, totaling 50,000 sq. ft. floor space. Cost over $60,000 with equipment. Francisco & Jacobus, 511 Fifth Avenue, New York, are architects and engineers. Main offices are at 435 Hudson Street, New York.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until April 9 for one electric salt bath furnace, for continuous heat treatment of aluminum, with automatic control (Schedule 1141) for Pensacola, Fla., Naval Air Station.

Bureau of Yards and Docks, Navy Department, Washington, asks bids until April 10 for three 150-ft. steel radio towers (Specifications 9516) for Jacksonville, Fla., Naval Air Station.

SOUTH CENTRAL

City Council, Kosciusko, Miss., asks bids until April 12 for extensions and improvements in municipal light and power plant and waterworks station, including additional equipment. Bond issue of $70,000 has been approved for work.

United States Engineer Office, Louisville, asks bids until April 12 for 34 cast steel valve blades, each weighing about 1050 lb., with shafts, keepers, taper pins, bolts, nuts, washers and bushings, each shaft weighing about 800 lb., for lock 52, Ohio River, Brookport, Ill. (Circular 306).

Brown Stove Works, Inc., Cleveland, Tenn., is erecting two one-story additions to double present floor area. Cost over $50,000 with equipment.

Director of Purchases, Tennessee Valley Authority, Knoxville, Tenn., asks bids until April 9 for two 95-hp. and two 70-hp. diesel crawler-type tractors and accessories for construction division, Spring City, Tenn.; until April 11, aluminum and steel work for Hiwassee power plant; until April 12, galvanized steel transmission towers for Columbia-Nashville, Tenn., high-tension lines; gasoline engine-driven radial gate hoist, 80,000-lb. load, for gates at Hiwassee power plant.

SOUTHWEST

Butler Mfg. Co., 7400 East Thirteenth Street, Kansas City, Mo., steel tanks, bins, prefabricated buildings, etc., has let general contract to Swenson Construction Co., Victor Building, for two-story addition, 45 x 290 ft., for expansion in machine shops, storage and distributing departments. Cost over $85,000 with equipment.

Emerson Electric Mfg. Co., 1824 Washington Street, St. Louis, motors, fans, etc., has let general contract to Widmer Engineering Co., Arcade Building, for new plant on 22-acre tract on West Florissant Avenue, recently acquired. Cost over $100,000 with equipment.

United States Engineer Office, Little Rock, Ark., asks bids until April 23 for outlet works for Clearwater dam on Black River, about six miles from Leeper, Mo., including traveling crane and rails, gates, hoists, operating house and other structures (Circular 100).

Board of Public Service, City Hall, Kansas City, Mo., Ralph W. Cameron, director, will take bids soon on general contract for new steel hangar, 200 x 300 ft., at municipal airport, with repair and reconditioning facilities. Cost about $170,000 with equipment. Alonzo H. Gentry, Voskamp & Neville, Inc., 4 West Thirteenth Street, is architect.

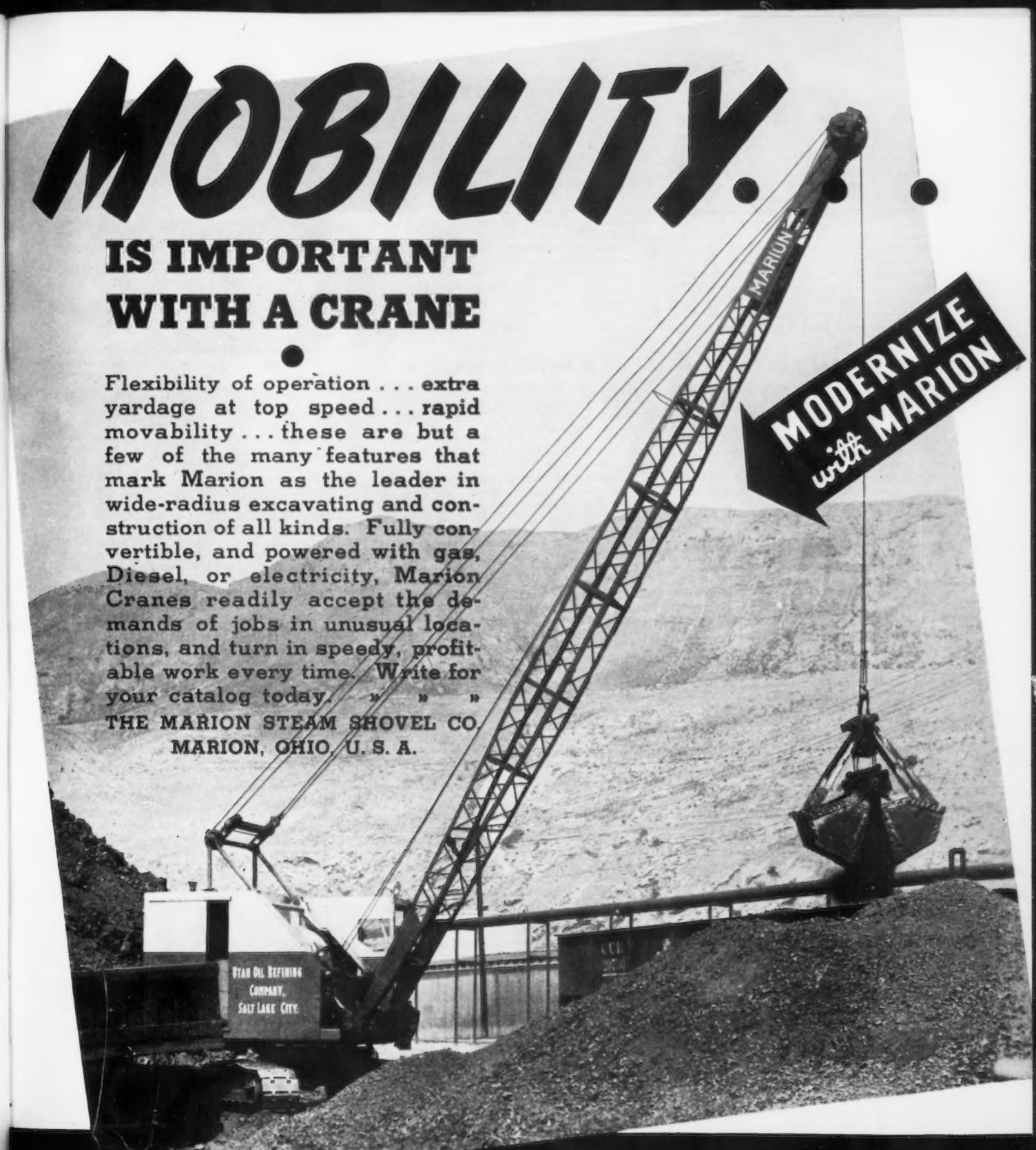
Lone Star-Trinity Gas Co., Crockett, Tex., has let general contract to Frick-Reid Co., 108 North Trenton Street, Tulsa, Okla., for new natural gas recycling plant near Grapeland, Tex., with compressor station, loading racks,

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SHOVELS • DRAGLINES • CLAMSHELLS
CRANES • PULL-SHOVELS • WALKERS

steel tank storage and other structures. Cost over $300,000.

Quartermaster, Fort Crockett, Crockett, Tex., asks bids until April 9 for electric parkway cable (Circular 220-27).

Hydril Co. of Texas, 4300 Calhoun Street, Houston, Tex., oil well equipment, has let general contract to George P. O'Rourke Construction Co., 3915 Center Street, Houston, for one-story building on 10-acre tract on McCarty Street, for storage and distribution. Cost over $50,000 with equipment.

Handland, Inc., St. Louis, L. C. Kuehner, president, railway equipment and supplies, is erecting one-story factory at 611 South First Street, containing about 25,000 sq. ft. of floor space. Cost more than $60,000 with equipment.

WESTERN PA. DIST.

Penn Alto Bottling Works, Inc., 2708 Wehnwood Road, Altoona, Pa., has asked bids on general contract for one and two-story addition to mechanical-bottling works, storage and distributing plant. Cost close to $45,000 with equipment. Hunter & Caldwell, 3601 Fifth Avenue, are architects.

Johns-Manville Corp., 22 East Fortieth Street, New York, has acquired former plant of Iron City Sanitary Mfg. Co., Zelienople, Pa., idle for about 10 years, and will modernize for production of refractory cements and kindred products.

Duquesne Brewing Co., South Twenty-second Street, Pittsburgh, has asked bids on general contract for one-story addition, part of structure to be used for new air-conditioning plant. Cost over $40,000 with equipment. Bollinger Co., Duss Avenue, Ambridge, Pa., is engineer.

BUFFALO DISTRICT

Rane Tool Co., Inc., Ross Street, Jamestown, N. Y., tools, dies, jigs, etc., plans one-story addition. Cost close to $50,000 with equipment.

Rochester Packing Co., 900 Maple Street, Rochester, N. Y., meat packer, plans one-story addition, including new boiler house. Cost over $50,000 with equipment. Smith, Brubaker & Egan, 30 North LaSalle Street, Chicago, are architects.

American Airlines, Inc., New York Municipal Airport, North Beach, New York, plans new steel hangar, with reconditioning and repair facilities, at municipal airport, Cheektowaga, Buffalo. Cost over $100,000 with equipment.

OHIO AND INDIANA

Kinetic Mfg. Co., Delphos, Ohio, mechanical equipment and parts, plans new one-story plant on Second Street, 62 x 200 ft. Cost over $70,000 with equipment.

Ohio Battery Ignition Co., 711 Tuscarawas Street West, Canton, Ohio, electric battery equipment, parts, etc., plans one and two-story plant, 85 x 170 ft., on Market Avenue North. Cost over $60,000 with equipment.

Industrial Rayon Corp., West Ninety-eighth Street and Walford Avenue, Cleveland, has asked bids on general contract for additions to branch mill near Painesville, Ohio, one-story, 80 x 225 ft., and one and two stories, 90 x 455 ft., with smaller units. Capacity will be increased about 50 per cent. Cost close to $4,000,000 with machinery. Wilbur Watson & Associates, 4614 Prospect Avenue, Cleveland, are architects and engineers.

John M. Hirst Coal Co., Salineville, Ohio, plans rebuilding tipple at mining properties near city, recently destroyed by fire. Loss close to $40,000 with crushing, conveying and other machinery.

Contracting Officer, Materiel Division, Air Corps, Wright Field, Dayton, Ohio, asks bids until April 9 for 12 wood-turning lathes, nine knife grinders, five disk sanders, 13 band saws, eight wood borers, nine wood-working circular saws, nine variety saws, 13 single surfacers, and other tools, all motor-driven (Circular 1229); until April 10, two motor-driven pantograph engraving machines (Circular 1259), one swivel vise, one index center, six collets and one chuck jaw for index head (Circular 1265); until April 11, motor-driven rotary swaging machine (Circular 1264), 4000 strain gages, resistance strip type (Circular 1277), 100 roller assemblies (Circular 1266); until April 12, two acetylene gas generators (Circular 1271), 200 strain gages, resistance strip type (Circular 1277); until April 15, two power hammers and one drop, rope and drum-type hammer, all motor-driven, and one blacksmith forge (Circular 1286).

Vonnegut Hardware Co., 120 East Washington Street, Indianapolis, will award contract soon for new two-story and basement storage and distributing building, 160 x 240 ft., at Pearl, Maryland and Missouri Streets. Cost over $160,000 with equipment. Vonnegut, Bohn & Mueller, Indiana Trust Building, are architects.

MIDDLE WEST

Metal Box & Cabinet Co., 4729 West Kinzie Street, Chicago, has let general contract to Adams & Schroeter, 217 North Mozart Street, for one-story and basement addition, 120 x 150 ft. Cost over $65,000 with equipment. W. R. Wendland, 7855 Stony Island Avenue, is architect and engineer.

Commanding Officer, Ordnance Department, Rock Island Arsenal, Rock Island, Ill., asks bids until April 8 for 24,540 ft. of extra flexible steel wire cable (Circular 808), stainless wire (Circular 806); until April 9, one 16-in. circular blade electric cut-off saw and one 24-in. hand planer and jointer (Circular 812).

Nash-Kelvinator Corp., Kenosha, Wis., has let general contract to Permanent Construction Co., 2712 North Holton Street, Milwaukee, for one-story addition to automobile plant, 240 x 250 ft., for machine shop expansion.

Doughboy Mills, Inc., New Richmond, Wis., E. J. Cashman, president, plans one-story soybean crushing plant in connection with soybean oil mill. Cost over $75,000 with machinery.

Crane Co., 4100 South Kedzie Avenue, Chicago, has let general contract to Kaiser-Ducett Co., 80 East Jackson Boulevard, for one-story addition for storage and distribution. Crane runway will be installed. Cost over $50,000 with equipment. Graham, Anderson, Probst & White, 80 East Jackson Boulevard, are architects.

City Council, Cedar Falls, Iowa, asks bids until April 16 for hydroelectric power plant at end of State Street, including power house, overhead crane and accessories (Section A), hydraulic turbines and governors (Section B), electric generators, exciters, voltage regulator, etc. (Section C), switchboard panels and accessories (Section D). Cost about $185,000. Clark N. Streeter is city engineer.

Giddings & Lewis Machine Tool Co., 142 Doty Street, Fond du Lac, Wis., machine tools and parts, has engaged F. J. Stepnoski & Son, 104 South Main Street, architects, to prepare plans for one-story addition. Cost over $75,000 with equipment.

MICHIGAN DISTRICT

George M. Peet Packing Co., Chesaning, Mich., meat packer, plans one-story addition. Cost close to $100,000 with equipment.

Buick Division, General Motors Corp., Flint, Mich., has let general contract to J. A. Utley, 720 East Ten-Mile Road, Royal Oak, Detroit, for two-story and basement additions, 138 x 959 ft., and 52 x 300 ft., for production of axles, and for expansion in sheet metal division. Latter structure will have two-story section with craneway. Company also will expand and rearrange division for production of axle gears. Entire project will cost over $1,200,000 with equipment. Albert Kahn, Inc., Detroit, is architect and engineer.

PACIFIC COAST

General Engineering & Drydock Co., foot of Fifth Street, Oakland, Cal., plans expansion and improvements in shipbuilding and repair plant, including several one-story mechanical shops, and other structures. Cost over $200,000 with equipment.

Commanding Officer, Ordnance Department, Ogden Ordnance Depot, Ogden, Utah, asks bids until April 23 for one track-laying tractor, diesel-powered, with dirt-handling, snow removal, and double-drum winch equipment (Circular 14).

Vega Airplane Co., 923 East San Fernando Boulevard, Burbank, Cal., has let general contract to Also Construction Co., 5423 Flemish Village Lane, Los Angeles, for one-story addition. Cost close to $40,000 with equipment. John and Donald B. Parkinson, Title Insurance Building, Los Angeles, are architects.

Walla Walla Canning Co., Walla Walla, Wash., has let general contract to A. S. Murray, Richland, Wash., for one-story fruit and vegetable processing and canning plant, 100 x 160 ft., at Kennewick, Wash. Cost over $50,000 with equipment.

Commanding Officer, Ordnance Department, Benicia Arsenal, Benicia, Cal., asks bids until April 9 for spot welder, valve seat grinder, valve resurfacer (Circular 52).

H. M. Thermo Control Co., 814 East 108th Street, Los Angeles, precision equipment and parts, plans one-story factory, 70 x 92 ft., with L-shaped extension. Cost close to $40,000 with equipment. S. B. Barnes, 803 West Third Street, is engineer.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until April 12 for motor-driven squaring shears and spare parts (Schedule 1123) for Mare Island Navy Yard; three motor-driven engine lathes (Schedule 1155); until April 19, airplane parts (Schedule 900-3202); until April 26, airplane parts (Schedule 900-3205) for San Diego, Cal., Naval Air Station.

Administrator, Bonneville project, 811 N. E. Oregon Street, Portland, asks bids until April 8 for ground rods and ground rod clamps for electric line service (Circular 923).

CANADA

Hespeler, Ont., M. E. Jarvine, clerk, is receiving bids for sewage system to cost $105,000. James, Proctor & Redfern, Ltd., 36 Toronto Street, Toronto, is engineer.

Metal Stampings, Ltd., 435 Fleet Street, Toronto, will start work immediately on a plant at Danforth and Eastwood Avenues, Scarboro Township, to cost $100,000.

Dominion Wheel & Foundries, Ltd., 171 Eastern Avenue, Toronto, has plans by James, Proctor & Redfern, Ltd., 36 Toronto Street, for erection of machine shop.

Hydro Electric System of Hamilton, 12 King Street East, Hamilton, Ont., will erect substation at Burlington Street and Gage Avenue to cost $400,000. A. W. Bradt is general manager.

Fundy Construction Co., Ltd., Isleville and Russell Streets, Halifax, N. S., has general contract for 14 buildings at Moncton, N. B., airport for Royal Canadian Air Force, War Supply Board, Ottawa.

War Supply Board, Ottawa, W. R. Campbell, chairman, plans construction of 15 buildings for airport at 118th Avenue and Kingsway, Edmonton, Alta., to cost $350,000.

Boeing Aircraft of Canada, Ltd., Vancouver, B. C., has acquired property for plant addition to cost $30,000.

FOREIGN

General Motors Corp., Detroit, plans new plant at Buenos Aires, Argentine Republic, where large tract is being secured, for parts production and assembling, with power house and other structures. Cost about $1,400,000 with machinery.

Electrical Construction Co. of Australia, Ltd., Brisbane, Queensland, Australia, plans new one-story plant for manufacture of electric cables and wire, a considerable part of output to be used by Government of Queensland, which is interested in project. Cost about $350,000 with equipment.

Tarapaca & Antofagasta Nitrate Co., Santiago, Chile, plans new works on property of Balkan Nitrate Co., Antofagasta Province, for production of nitrate under new process. It will comprise several large production units, storage and distributing buildings, and other structures. Cost over $400,000 with machinery. Company is affiliated with Chilean Nitrate & Iodine Sales Corp., Santiago.